Project Manual:

VETERANS MEMORIAL PARK TRAIL ENHANCEMENTS

City of Moore

Cleveland County, Oklahoma

Owner Project No. **2024-006**
Landscape Architect Project No. **2135**

LAUD
Landscape Architecture
+ Urban Design

LAUD Studio
220 NW 13th Street Suite 1
Oklahoma City, OK 73103
Phone: 405.420.8800
Web: www.laudstudio.com

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1.1 Design Professional of Record

A. I hereby certify that the Project's Technical Drawings and Specifications were authored and prepared by me and/or under my direct supervision and that I am duly registered under the laws of the State of Oklahoma.

1. Landscape Architect:
   Brent Wall, LAUD Studio

CA# 02418

00 00 00
TECHNICAL SPECIFICATIONS
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01 56 39
TREE PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the protection and trimming of trees that interfere with or are affected by, execution of work, whether temporary or permanent construction.

1.2 PROJECT CONDITIONS

A. Variations in Site Conditions: If a condition is observed while the work is being performed that requires attention beyond the original scope of work, the conditions shall be immediately reported to the landscape architect.

PART 2 - EXECUTION

2.1 PREPARATION OF TREE PROTECTION ZONES

A. Temporary Fencing: Install temporary fencing around tree protection zones to protect trees and vegetation from construction damage. Temporary fence to remain in place until after the completion of work.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Do not store construction materials, debris, or excavated material inside tree protection zones. Do not permit vehicles or foot traffic within tree protection zones. Prevent soil compaction over root systems.

D. Maintain tree protection zones free of weeds and trash.

2.2 TREE PRUNING

A. Pruning Standards: Prune Trees according to ANSI A300 (Part 1) as follows:

1. Type of Pruning: Cleaning. Obtain approval from Landscape Architect or Owner's authorized representative prior to removing branches greater than 2.5" in diameter.

2.3 TREE REPAIR

A. Promptly contact The City of Moore Public Works Department at 405-793-5070 to schedule repair for trees damaged by construction operations within 24 hours.

B. Trees indicated to remain in place that are damaged or die during construction such that the Landscape Architect determine are incapable of restoring to normal growth pattern shall be replaced at the Contractor's expense.

C. Replacement trees shall be provided as follows:
   1. Provide new trees of 6-inch caliper size and of a species selected by the Landscape Architect when damaged trees more than 6 inches in caliper size, measured 12 inches above grade, are required to be replaced.
   2. Trees smaller than 6 inch caliper size, measured 12 inches above grade, shall be replaced by a comparably sized tree of a species selected by the Landscape Architect.
   3. The minimum size for replacement shall be 3" caliper. Tree selections shall be well shaped, fully branched, healthy, vigorous stock densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
   4. Plant trees as outlined in Section 329300 Trees, and maintain as outlined in 320190 Establishment Maintenance.

END OF SECTION 01 56 39

02 41 19
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Items indicated to be removed and salvaged remain Owner's property. Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse. Include fasteners or brackets needed for reattachment elsewhere.

1. Deliver Salvaged Items to The City of Moore's Public Works Administration, 512 NW 27th Street. Moore, OK 73160. Coordinate delivery with Public Works 405-793-5070.

B. Pre-demolition Photographs: Show existing conditions of adjoining construction and site improvements. Submit before Work begins.

PART 2 - PRODUCTS

1.2 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with EPA regulations and with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

1.3 DEMOLITION

A. Maintain structures indicated to remain and protect them against damage during selective demolition operations.

B. Locate, identify, shut off, disconnect, and seal or cap off utility services and mechanical/electrical systems serving structures to be selectively demolished.

C. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent structures to remain.

D. Neatly sawcut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.

E. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill. Do not burn demolished materials.

F. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. The extent of cast-in-place concrete is shown on the drawings.

B. Related Work:
Section 02220: Excavating, Backfilling & Compacting

1.2 QUALITY ASSURANCE

A. The Contractor shall provide miscellaneous items necessary to completely construct the improvements described in these plans and specifications. The contractor shall make a field inspection of project site and determine the extent, costs, and methods necessary to properly construct the following, but not limited to, work items.

B. The purpose of this construction is to provide an even, smooth concrete surface where walking can be accomplished without undue interference from a rough surface or joints. It is, therefore, necessary for the control joints to be precisely cut to prevent random cracks. Extra care shall be exercised in the sealing operation to prevent overfilling of joints or spillage of the filler material.

C. Random cracks will not be tolerated.

D. Joints shall be placed as shown in drawings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

C. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color, pattern, or texture selection.

D. Samples for Verification: For each type of exposed color, pattern, or texture indicated.

E. Other Action Submittals:

1. Design Mixtures: For each decorative concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Applied finish materials.

C. Material Test Reports: For each of the following:

1. Aggregates. Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer of decorative concrete paving systems.

B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing readymixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Source Limitations: Obtain decorative concrete paving products and each type or class of cementitious material of the same brand from same manufacturer's plant, and obtain each aggregate from single source.

E. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.

F. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of full-thickness sections of decorative concrete paving to demonstrate typical joints; surface color, pattern, and texture; curing; and standard of workmanship.
2. Build mockups of each decorative concrete paving type not less than 5 feet by 10 feet.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Landscape Architect specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to decorative concrete paving, including but not limited to, the following:

    a. Concrete mixture design.
    b. Quality control of concrete materials and decorative concrete paving construction practices.

2. Require representatives of each entity directly concerned with decorative concrete paving to attend, including the following:

    a. Contractor's superintendent.
    b. Independent testing agency responsible for concrete design mixtures.
    c. Ready-mix concrete manufacturer.
    d. Decorative concrete paving Installer.
    e. Manufacturer's representative of decorative concrete paving system.

1.6 TESTING

A. Each pour shall be tested. For pours exceeding fifty (50) cubic yards, obtain an additional test for every fifty (50) cubic yards thereafter.

B. Provide copies of all test results to Landscape Architect.

C. All concrete testing shall be paid for by the Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The concrete for this job will be 3500 P.S.I. air-entrained concrete.

B. Cement: Portland Cement, (ASTM C-150, Type I).

C. Fine aggregate: Sand particles shall be coarse, sharp, clean, and conforming to ASTM C-33.

D. Coarse aggregate:

1. Crushed limestone conforming to ASTM C-33 for normal weight concrete.

2. Light weight conforming to ASTM C-330 for semi-light weight concrete. Minimum Fsp (splitting ratio) of 6.0.

E. Water: Clean and free from injurious amounts of oil, acids, alkalis, organic materials, or other deleterious substances.

F. Dowels

1. Anchor Dowels shall be 1/2" x 36" smooth steel with a dowel cap on one end. Anchor Dowels are to be placed on 24" centers or as shown on the drawings. Center Dowels on expansion joints.

2. #3 & #4 rebar as shown in detail in the drawings.

PART 3 - EXECUTION

3.1 PLACING

A. Notify Owner's Representative of intent to pour at least twenty-four (24) hours prior to placing concrete.

B. Remove debris from spaces to be occupied by concrete. Forms to be removed shall be thoroughly wetted or oiled. Remove excess water from place of deposit. Do not deposit concrete during rain unless it is adequately protected. If placed during rain, be prepared to protect concrete from rain until it has hardened sufficiently so as to not be damaged.

C. Thoroughly compact concrete by suitable means during placing and work around reinforcement and into corners and recesses of forms. Use vibrators under competent supervision.

D. Sub-grade for Concrete Paving. The intention is to provide a stable base for the installation of the concrete. The sub base and any fill under the paving shall be compacted to 95% standard Proctor Density. Contractor shall perform and submit a minimum of two compaction tests for the paved areas at each site to verify proper compaction.

E. Any excess cut for the project shall be placed in a manner as to blend with the existing grades and contours and be sufficiently compacted as to minimize erosion. This will not be a temporary location, but will remain a permanent feature of the park. Rough grading can be accomplished with motorized equipment. Fine grading shall provide a surface that can be mowed.

F. Placing the concrete will be scheduled to avoid times of high wind, low humidity, or variations in high and low temperatures of more than 40 degrees in a 24-hour period. If these weather conditions cannot be avoided, measures such as wind breaks and fog spray of the area will be used during concrete placement.

G. Finish elevations for concrete walks and pad surfaces shall not vary more than 1 inch above finish elevations to allow placement of sod.

H. Finish for all concrete surfaces will be a light broom finish. The concrete should be troweled once before being broomed.

END OF SECTION 03 30 00

12 93 00
SITE FURNISHINGS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The contractor shall provide all labor, materials, and appurtenances necessary for the complete and proper installation of the following site furnishings as shown in Drawings, and specified herein including:

1. Tables and Benches
2. Trash Receptacles
3. Bollards

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data, storage and handling requirements and recommendations, installation methods and available colors, styles, patterns and textures.

B. Shop Drawings: Submit manufacturer's shop drawings, including plans and elevations, indicating overall dimensions.

C. Samples: Submit manufacturer's samples of materials, finishes, and colors; including actual materials on suitable substrates for true representation of color and textures of products.

D. Warranty: Submit Manufacturer's standard warranty.

E. Product Date: Submit manufacturer's product date to the Landscape Architect simultaneously with other product submittals for approval prior to work beginning.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Manufacturer regularly engages in manufacture of site furnishings.

B. Product Support: Products are supported with complete engineering drawings and design patents.

C. Facility Operator: Manufacturer's welders and machine operators are certified.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials in clean, dry area in accordance with manufacturer's instructions. Protect from damage and theft.

C. Handling: Protect materials and finish during handling and installation to prevent damage.

1.5 WARRANTY

A. Minimum Warranty Required:

1. Products will be free from defects in material and/or workmanship for at least three years from the date of invoice. Damage resulting from accident, alteration, misuse, tampering, negligence, or abuse is not required to be covered.

2. Manufacturer shall, repair, replace, or refund the purchase price of any items found defective upon inspection.

PART 2 - SITE FURNISHINGS

2.1 TABLE AND BENCH STYLES

A. Virden Bench with Back

1. Styles and Quantities
   a. 14006-72, 6' length
2. Material: Powder coated aluminum.
3. Finish: RAL 7004
4. Quantity: 5 (Base bid) 7 (Add Alternate 1)
5. Installation: Surface mounted.
6. Manufacturer: Benchmark Contract Furniture 904.246.9008
   456 Osceola Avenue, Jackson Beach, FL 32250
7. Submittal: Product sheet with all selections and options indicated, installation instructions, and warranty information.

2.2 RAUTSTER

1. Options: RTS157
2. Quantity: 2 (Add Alternate 1)
3. Wood: Tropical with chessboard engraving
4. Frame Color: RAL Color to be Determined

5. Installation: Surface mount on concrete slab.
6. Manufacturer: MM Cité USA LLC, 2905 Westinghouse Blvd, Suite 100 Charlotte, NC 28273 704 995 1942 quotations@mmcite.com
7. Submittal: Product sheet with all selections and options indicated, installation instructions, and warranty information.

2.3 TRASH RECEPTACLE STYLES

A. Metrix 40 Gallon Trash Receptacle, Side Door

1. Item #: L2009
2. Quantity: 2
3. Color: Textured Pewter
4. Installation: Place cans on concrete slab/sidewalk
5. Manufacturer: Anova 1(800) 325-3047 sales@anovafurnishings.com

   1424 Talmage Ave, St. Louis, Mo 63110
6. Submittal: Product cutsheet, color/finish chart with selections indicated, and warranty information.

2.4 BOLLARDS

A. Double Locking Retractable Bollard

1. Item #: R-8472
2. Quantity: 4
3. Material: Brushed Stainless Steel with Reflective White Stripe
4. Installation: Retractable, New Concrete
5. Manufacturer: Reliance Foundry Ltd.

   Phone: 604-547-0460 or 1-877-789-3245, Fax: 604-590-8875, https://www.reliancefoundry.com/bollard, info@reliance-foundry.com
6. Submittal: Product cutsheet with selected options indicated, installation instructions, and warranty information.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper execution of the work.

C. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

A. Install the work of this Section in strict accordance with the manufacturer's instructions, consultant drawings, and approved shop drawings.

B. Install furnishings level and plumb, anchor securely following manufacturer's instructions, at elevations indicated in drawings.

1. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

3.3 COORDINATION

A. Coordinate, as required, with other trades to assume proper interface with the work in this Section.

3.4 ADJUSTING

A. Finish Damage: Upon completion of the installation, repair minor damages to finish in accordance with manufacturer's instructions to be completely invisible to the unaided eye from a distance of five feet.

B. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Landscape Architect.

3.5 CLEANING

A. Clean furnishings promptly after installation in accordance with manufacturer's instructions.

B. Do not use harsh cleaning materials or methods that could damage finish.

3.6 PROTECTION

A. Protect installed furnishings to ensure that, except for normal weathering, furnishings will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 12 93 00

22 14 13
SUBDRAINAGE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide site drainage for site as shown and specified. The work includes:

1. Drainage structures and piping.

2. Excavating and backfilling site drainage work.

1.2 QUALITY ASSURANCE

A. Comply with Section 32 30 00 SITE IMPROVEMENTS requirements

B. Materials and methods of construction shall comply with the following:

1. Oklahoma Department of Transportation Standards and Specifications

2. American Society for Testing and Materials (ASTM).

3. American Association of State Highway and Transportation Officials (AASHTO).

C. Excavating, backfilling and compacting operations: Comply with Section 31 23 33 requirements and as specified.

D. Obtain acceptance of Landscape Architect of installed and tested site drainage system prior to installing backfill materials.

E. Identify all existing underground utilities and their location.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Provide site drainage record drawings:

1. Legibly mark drawings to record actual construction.

2. Indicate horizontal and vertical locations, reference to permanent surface improvements

3. Identify field changes of dimension and detail changes made by Change Order.

C. Prior to installation, submit samples of drain product and sample of filter fabric.

1.4 PROJECT CONDITIONS

A. Known underground and surface utility lines are indicated on the Drawings.

B. Protect existing trees, plants, lawns and other features designated to remain as part of the landscape work as shown on the Drawings.

C. Protect excavations by shoring, bracing, sheeting, underpinning or other methods as required to prevent cave-ins or loose dirt from entering excavations.

D. Barricade open excavations and post warning lights at work adjacent to public streets and walks in accordance with OSHA requirements.

E. Underpin adjacent structures including utility service lines, which may be damaged by excavation operations.

F. Promptly repair damage to adjacent facilities caused by site drainage earthwork operations. Cost of repair at Contractor's expense.

G. Promptly notify the Landscape Architect of unexpected subsurface conditions.

PART 2 - PRODUCTS

2.1 PERFORATED-WALL PIPES AND FITTINGS

A. Perforated PE Pipe: 4" ASTM F405, Type CP; corrugated exterior, with smooth interior

2.2 ACCESSORIES

A. Concrete to bed outlet in curb or adjacent to channel as required.

B. Geotextile: Rot-resistant 3.5 ounce, nonwoven, polypropylene filter fabric, water-permeable and unaffected by freezing and thawing

C. Soil Materials: Backfill, drainage course, impervious fill, and satisfactory soil materials are specified in Section 31 23 33 EXCAVATION, BACKFILLING AND COMPACTING

D. Animal guard to fit inside pipe outlet and allow for cleaning of pipe.

PART 3 - EXECUTION

3.1 DESCRIPTION

A. Lay out site drainage work and establish extent of excavation by area and elevation. Designate and identify datum elevation and project engineering reference points. Set required lines, levels and elevations.

B. Do not cover or enclose work of this Section before obtaining required inspections, tests, approvals and location recording.

3.2 EXISTING UTILITIES

A. Conform to Section 32 30 00 SITE IMPROVEMENTS

3.3 INSTALLATION

A. Perform excavating and backfilling as required to install site drainage work.

B. Provide trench wall support and pumping of surface and ground water as required to provide suitable conditions.

C. Excavate trenches to accommodate indicated bedding conditions and material. Trim and shape trench bottoms to proper line and grade, free of irregularities. Remove unstable material and replace with compacted fill.

D. Install site drainage system true to grade and alignment indicated.

1. Provide necessary equipment for lowering pipe and drainage matrix safely into trenches and flat surface. Handle pipe and accessories to prevent damage. Damaged materials replaced at Contractor's expense.

2. Do not place pipe in water, nor when trench is unsuitable for site drainage due to weather.

3. Remove all dirt and foreign material from pipe before installation. Provide bulkheads as required to prevent entrance of dirt or water after installation.

4. Encase pipe with sock-style geotextile filter fabric, covering exposed terminal ends, and install pipe.

5. Cut pipe ends entering structures flush with inner face of structures.

6. Provide geotextile filter fabric over granular backfill at perforated site drainage piping.

7. Extend site drainage system to outfall indicated and make required connection.

8. Sub-drain pipe installation: Conform to AASHTO M252-851.

9. The pipe and fittings shall be homogeneous and uniform in color, opacity and density. The pipe walls shall be free of cracks, holes, blisters, voids, foreign inclusions, and other defects that are visible to the naked eye and that may affect the wall integrity, except that holes intentionally placed in perforated pipe are acceptable.

10. Add drainage course to width of at least 6 inches on each side and to top of pipe to perform tests.

11. Obtain required inspections and perform testing prior to backfilling. Remove obstructions, replace damaged components and retest as required. Provide a satisfactory free flowing drainage system.

12. After satisfactory testing, cover drainage piping to width of at least 6 inches on sides and above top of pipe to within 12 inches of finish grade.

13. Fill to Grade: Place and compact impervious fill material over compacted drainage fill.

END OF SECTION 22 14 13

31 23 13
EXCAVATING, BACKFILLING, AND COMPACTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Excavate, backfill, compact and grade the site to the elevations shown on the drawings as specified herein and as needed to meet the requirements of the construction shown in the Drawings.

1. Work Included: Do all cutting, filling, compacting of fills and rough grading required to bring the entire project area to sub-grades as follows:

a. For surfaced areas – to the respective surfacing or base course, and fixed by the finished grades therefore. Plans indicate finish spot elevations. Calculate sub-grade elevations and finish work to provide designed grades and drainage.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Use equipment adequate in size, capacity and numbers to accomplish the work of this Section in a timely manner.

C. Protection: Protect newly graded areas from the actions of the elements. Any settlement or washing that occurs prior to acceptance of the work shall be repaired, and grades re-established to the required elevations and slopes. Fill to required sub-grade levels any areas where settlement occurs.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Fill and backfill materials:

1. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 4" in greatest dimension and with not more than 15% of the rocks or lumps larger than 2-3/8" in their greatest dimension. Fill shall be reasonably free from roots, wood, or other organic material.

2. Do not permit rocks having a dimension greater than 1" in the upper 12" of fill or embankment.

3. Excavated material that is suitable may be used for fills indicated or required.

4. Quality of fill material shall be approved by Landscape Architect where fill is required to raise the existing grades to a new sub-grade elevation indicated on Drawings.

5. All stone discovered during excavation shall be retained and stored on site.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Utilities: Refer to Site Work or other related specifications in this document.

B. Protection of persons and property:

1. Barricade open holes and depressions occurring as part of the work and post warning lights on property adjacent to or with public access.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
3. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.

C. Dewatering:

1. Remove all water, including rain water, encountered during trench and sub-structure work to an approved location by pumps, drains and other approved methods.
2. Keep excavations and site construction area free from water.

D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors and to other work being performed on or near the site.

E. Maintain access to adjacent areas at all times.

F. Job Conditions:

1. Do not deposit any fill on a sub-grade that is muddy, frozen, or that contains frost.
2. Positive drainage should be provided during construction and maintained throughout the life of the proposed development. Infiltration of water into utility or foundation excavations must be prevented during construction.

3.2 EXCAVATING

A. Perform excavating of every type of material encountered within the limits of the work to the lines, grades and elevations indicated and specified herein.

B. Excavation of rock:

1. Where rocks, boulders, granite or similar material is encountered and cannot be removed or excavated by conventional earth moving or ripping equipment, take required steps to proceed with the general grading operations of the work and remove or excavate such material by means which will neither cause additional cost to the Owner nor endanger buildings or structures whether on or off the site.

2. Do not use explosives without written permission from the City Manager.

C. Excavate and backfill in a manner and sequence that will provide proper drainage at all times. Excess cut shall be placed on-site to match existing grade in a location determined by the Landscape Architect.

D. Remove all debris subject to termite attack, rot or corrosion, and all other deleterious materials from areas to be filled. Prior to placing fill material, the surface of the ground shall be scarified to a depth of six inches (6") and the moisture content of the loosened materials shall be such that it will readily bond with the first layer of fill material.

E. Hauled Borrow:

1. Obtain material required for fill as outlined in 2.1 Soil Material of this specification.

F. Swales, ditches, gutters:

1. Cut accurately to the grades and elevations shown.

2. Maintain excavations free from detrimental quantities of leaves, sticks, trash and other debris until completion of the work.

G. Unauthorized excavation:

1. Unauthorized excavation consists of removal of materials beyond indicated sub-grade elevations or dimensions without specific instruction from the Landscape Architect.

2. Under footings or retaining walls:

a. Fill unauthorized excavations by extending the indicated bottom elevation of the footing or base to the excavated bottom without altering the required top elevation.

3. Elsewhere:

    a. Backfill and compact unauthorized excavations as specified for authorized excavations, unless otherwise directed by the Landscape Architect.

H. Stability of excavations:

1. Slope sides of excavations to 1:1 or flatter, unless otherwise directed by the Landscape Architect.

2. Shore and brace where sloping is not possible because of space restrictions or stability of the materials being excavated.

3. Maintain sides and slopes of excavations in a safe condition until backfilling is completed.

I. Excavating for structures:

1. Conform to elevations and dimensions shown within a tolerance of 0.10 ft and extending a sufficient distance from footings and foundations to permit placing and removing concrete formwork, installation of services, other construction required and for inspection.

2. In excavating for footings and foundations, take care not to disturb bottom of excavation:

    a. Excavate by hand tools to final grade just before concrete is placed.
    b. Trim bottoms to required lines and grades to leave solid base to receive concrete.
    c. Excavate for footings and foundations only after general site excavating, filling and grading are complete.

J. Cold weather protection:

1. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.3 FILLING AND BACKFILLING

A. General:

1. For each classification listed below, place acceptable soil material in layers to required sub-grade elevations.

    a. In excavations: Use satisfactory excavated or borrow materials.
    b. Under slabs: Use granular fill, if so called for on the Drawings.
    c. Fill areas shall consist of good dirt and shall be compacted to required standard proctor density (see 3.04 "Compacting").

B. Ground surface preparation:

1. Remove vegetation, debris, unsatisfactory soil materials, obstructions and deleterious matter from ground surface prior to placement of fills.

2. Plow, strip or break up sloped surfaces steeper than one vertical to four horizontal so that fill material will bond with existing surface.

3. When existing ground surface has a density less than that specified under "compacting" for the particular area:

    a. break up the ground surface

    b. pulverize

    c. moisture-condition to the optimum moisture content

    d. compact to required depth and percentage of maximum density.

C. Rough Grading:

1. Rough grading of all areas within the project, including excavated and filled sections and adjacent transition areas shall be reasonably smooth, compacted and free from irregular surface changes.

2. The degree of finish shall be that ordinarily obtainable from either blade-grader or scraper operations, except as otherwise specified.

3. The finished sub-grade surface generally shall be not more than 0.33 feet above or below the established grade or approved cross section, with due allowance for topsoil, sod and pavement depths.

4. The tolerance for areas within ten feet (10') of structures and all areas to be paved, shall not exceed 0.15 feet above or below the established sub-grade.

5. All ditches, swales and gutters shall be finished to drain readily.

6. Provide roundings at top and bottom of banks and at other breaks in grade.

G. Replacing Topsoil:

1. Place no topsoil until sub-grade has been approved.
2. Scarify soil to a depth of three inches (3").
3. Spread, rake, and compact topsoil to form a layer with minimum depth of six inches (6") so that after settlement there will be proper drainage conforming to elevations on Drawings.
4. Maintain surfaces (protecting with cover if necessary).

3.4 COMPACTING

A. Control soil compaction during construction according to ASTM D1557, and as approved by Landscape Architect.

1. Structures:

a. Compact the top 8" of sub-grade and each layer of fill material or backfill material at 95% of proctor density.

2. Lawn and unpaved area:

a. Compact the top 8" of sub-grade and each layer of fill material or backfill material at 85% of proctor density.
b. Compact the upper 12" of filled areas, or natural soils exposed by excavating, at 85% of proctor density.

3. Walks:

a. Compact the top 8" of sub-grade and each layer of fill material or backfill material at 95% of proctor density.

4. Pavements:

a. Compact the top 8" of sub-grade and each layer of fill material or backfill material at 95% of proctor density.

B. Moisture control:

1. Wet soil material may be stockpiled or spread and allowed to dry.

2. Assist drying by disking, harrowing or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture density relation tests approved by the Landscape Architect.

3.5 FIELD QUALITY CONTROL

A. Secure Landscape Architect’s inspection and approval of subgrades and fill layers before subsequent construction is permitted thereon.

B. Provide field density testing of earthwork areas as required by the Landscape Architect.

C. If, in the Landscape Architect's opinion based on reports of the testing laboratory, sub-grade or fills which have been placed are below specified density, Contractor shall provide at their cost, additional compacting and testing as required to provide proof of compliance to these specifications.

3.6 MAINTENANCE

A. Protection of newly graded areas:

1. Protect newly graded areas from traffic and erosion and keep free from trash and weeds.

2. Repair and reestablish grades in settled, eroded and rutted areas to the specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape and compact to the required density prior to further construction.

3.7 CERTIFICATION

A. Upon completion of this portion of the work and as a condition of its acceptance:

1. Deliver to the Landscape Architect a written report certifying that the compaction requirements have been obtained.

a. State in the report the area or fill or embankment, the compaction density obtained and the type or classification of fill material placed.

END OF SECTION 31 23 13

32 13 73
LANDSCAPE JOINT SEALANTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data Sheet

B. Environmental Limitations: Do not proceed with installation of joint sealants when ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under service and application conditions.

B. Sealant for Use in sidewalk and slab joints:

1. SureBond SB-1300 Joint Stabilizing Sealer or Approved Equal

2.2 MISCELLANEOUS MATERIALS

A. Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

D. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with ASTM C 1193, ASTM E 514-90, ASTM D 1653-93, ASTM C 1028-89.

B. Install sealant backings to support sealants during application and to produce cross-sectional shapes and depths of installed sealants that allow optimum sealant movement capability.

C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

D. The pavement surface should be clean and free from oil, dust and any loose material. If necessary, use SB-442 General Stain Remover to clean paving (refer to label and data sheet for guidelines).

E. Sealant colors shall be pre-approved by the Landscape Architect. Contractor shall match the color of the sealant to the finished and dried color of the placed concrete.

F. Drying Time: The paver surface should be dry to the touch within approximately 30 minutes of application. Ensure that pavement is protected from moisture and traffic for at least 24 hours after application and, although initial joint stabilization occurs quickly, complete curing will take additional time. Drying time will vary depending on temperature and humidity.

END OF SECTION 32 13 73

32 15 40
CRUSHED STONE SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Unbound Crushed Stone

2. Decomposed Granite Surfaces with Organic-Lock Binder.

1.3 REFERENCED STANDARDS

A. American Association of State Highway and Transportation Officials

1. AASHTO M 288-96: Geotextile Specification for Highway Applications.

B. American Society for Testing and Materials.

1. ASTM C 136 Method for Sieve Analysis for Fine and Coarse Aggregates.

2. ASTM C 117 Method of Test for Materials Finer Than 75-micro m (No. 200) Sieve in Mine Aggregates by Washing.

3. ASTM D 698 Methods for Laboratory Compaction of Soil Using Standard Effort.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Crushed stone.

B. Qualification Data: Submit certified documentation of successful experience of no less than 3 years in the installation of similar crushed stone paving in comparable scale projects.

C. Samples: For the following:

1. 1 qt for each size and color range of crushed stone.

D. Material Test Reports: Submit sieve analysis of proposed material to ensure it meets grading requirements.

E. Field Quality Control Tests: Submit compaction test results.

F. Maintenance Procedures: Submit no later than fourteen days before Substantial Completion, recommended routine maintenance and spot repair procedures for City of the Moore Public Works.

1.5 QUALITY ASSURANCE

A. Qualifications Installer: Require at least three years experience in similar work.

B. Qualifications Testing Laboratory: Require an independent agency qualified to conduct testing.

C. Tests: Test graduation of granite material in accordance with ASTM C 136.

1.6 DELIVERY STORAGE AND HANDLING

A. Delivery:

1. Delivery of Organic-Lock is available from the manufacturer or select Organic-Lock dealers. Please contact the manufacturer for more information.

2. Delivery of Organic-Lock pre-blended with aggregate is available from select dealers. Contact your closest dealer or the manufacturer for more information.

B. Handling:

1. When dealing with un-blended Organic-Lock, wear appropriate respirator when ventilation is inadequate. Avoid contact with skin and eyes.

C. Storage:

1. Protect stabilized crushed aggregate mix from contamination. Store undercover. If the blended and hydrated aggregate is sitting for long periods of time (longer than 48 hours), or when subject to rainfall, it needs to be turned with a skid steerer or loader to ensure consistent moisture content throughout prior to installation. Verify hydration level with snowball test before installation. For any questions regarding storage, contact the manufacturer or local dealer.

1.7 PROJECT/SITE CONDITIONS

A. Environmental Requirements:

1. Ensure that the subgrade and base are properly graded and compacted to required specifications.

2. Do not install the Organic-Lock pathway aggregate during rain. Rain within 3-5 days after installation will increase curing time.

3. Protect all nearby surfaces, plants, and structures from possible contamination from materials or damage by equipment.

4. It is not recommended to install when temperatures are below 40 degrees.

1.8 TEST PLOT

A. Install [16] square feet minimum of stabilized crushed aggregate paving including base course, at location approved by Landscape Architect.

B. Allow Landscape Architect to view test plot before proceeding with rest of stabilized crushed aggregate paving.

C. Approved mock-up may remain as part of completed Work.

1.9 PROHIBITED VEHICLES

A. Excluded Vehicles: All skid-steered tracked vehicles, metal or rubber, forklifts, scissors lifts, dumpsters, or roll-off containers shall be prohibited from finished surface even if protected.

1.10 SPARES

A. Provide City of the Moore Public Works the following excess materials for use in future maintenance:

1. Two 50 lb. bags of premixed crushed stone.

PART 2 - PRODUCTS

2.1 CRUSHED STONE SURFACING

A. Decomposed granite or crushed granite aggregate. Free from clay lumps, organic matter, and deleterious material. Blends of course sand and rock dust are not permitted.

B. Organic-Lock for Organic-Lock stabilized pathway aggregate provided by:

Envirobond Products Corporation

6191-2100 Bloor Street West

Toronto, Ontario, Canada

M6S 5A5

1- 866-636-8476

info@envirobond.com

www.envirobond.com

www.organic-lock.com

C. Suppliers: Subject to compliance with requirements, provide products by one of the following:

1. Minick Materials, “Desert Gold Screenings with Organic - Lock”

D. Use only a single supply source for the entire quantity required.

E. Crushed stone sieve analysis percentage weight passing a square mesh to ASTM C 136 & 117:

Sieve	Passing Percent
#4	80 – 100%
#8	65 - 90 %
#16	40 - 65 %
#30	25 - 55 %
# 50	15 – 35%
# 100	10 – 20%
# 200	5 – 15%

F. Organic-Lock Binder

1. Patented powdered organic binder designed to be blended with crushed aggregate.
2. Made from 100% naturally occurring materials.

2.2 ACCESSORIES

A. Water: Fresh, clean, potable water.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that adjacent subgrades and subbases have been installed and are conforming prior to commencement of work.

B. Proper hydration of the Organic-Lock blended aggregate is crucial to the installation and longevity of the surface. The instructions below refer to Organic-Lock that has been pre-

blended with aggregate and contains optimal moisture content. For more information on pre-wetting, and pre-blending Organic-Lock refer to our installation guideline video

https://www.youtube.com/watch?v=mzQ-vZu2ynw&list=PL4SwT3V0vLBg_K6VCTUWAuep3zDg_0yCv&index=6&t=40s

C. Achieve best results installing Organic-Lock blended aggregate in dry conditions and temperatures above 40° Fahrenheit (5° Celsius). Both wet and cold conditions slow down the curing/drying process.

3.2 PREPARATION

A. Protect structures, foundations, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by operations.

B. Provide erosion-control measures to prevent erosion, displacement of soils, discharge of soil-bearing water runoff or airborne dust to adjacent properties and completed work.

C. Proof-roll prepared subgrade surface to check for unstable areas and verify need for additional compaction. Proceed with paving only after nonconforming conditions have been corrected.

D. Thoroughly clean subgrade area of all debris, loose dirt and other extraneous materials before installing crushed stone.

E. Prepare the Subgrade

1. Excavate the area to the depth required so that finish grade can be established as noted on plans.

2. A Foot-Traffic Pathway will require a full depth of 7-9 inches: 4-6 inches of compacted base depth together with 3 inches of compacted Organic-Lock Pathway Aggregate.

3. Compact the subgrade to 95% Modified Proctor Density.

F. Prepare the Base

1. Install the base material as per your region’s approved DOT road base guidelines. Clear stone or ungraded base is NOT acceptable in this application. Compact the base to 95% modified proctor density.

2. Foot-Traffic Pathway will require 4-6 inches of compacted base material. Depending upon the method of compaction the installation of base material may require separate lifts. 4 inches can be compacted in a single lift with a minimum 2-ton compaction roller.

3. Compact the subgrade to 95% Modified Proctor Density using a single or double drum static roller or vibratory compactor.

3.3 WATERSHED MANAGEMENT

A. Crowns and/or cross-slopes must be incorporated into the compacted base material.

B. If the slope is 2% or lower, a crown should be incorporated into the pathway. If the slope is greater than 2%, incorporate a cross-slope.

C. Note: The addition of crowns and cross-slopes is heavily dependent upon surrounding watershed.

3.4 SPREADING

A. The use of a paving machine is highly recommended for large projects to evenly spread Organic-Lock Pathway Aggregate at the specified depth. It's recommended to screed the material to ensure the depth is consistent for smaller projects or projects with tight areas.

B. Spread the loose and uncompacted Organic-Lock Pathway Aggregate over the compacted base material.

C. Typically, a lift of 4 inches of loose, pre-wet Organic-Lock Pathway Aggregate will compact to the required 3-inch depth for Foot-Traffic Pathways.

3.5 COMPACTION

A. Make 4-6 passes using a 1-ton double or single static drum roller, or equivalent. A Foot-Traffic Pathway will typically require one lift, compacted to 3 inches.

B. Compaction will vary with different aggregates due to particle shape and size. It will compact 20-25%, less if using paving machinery. This level of compaction needs to be monitored as early as possible (starting during the test plot) to determine the actual degree of compaction. It is better to put down too much material and to remove it from the top than to put down too little and add a layer later.

C. Compact to 95% Modified Proctor Density.

D. Note: Vibratory compaction is acceptable for the base material but generally not suitable for Organic-Lock blended aggregate as it risks disassociating the bonds of the stabilized aggregate or allowing the fines and moisture to migrate to the surface, causing the surface to take on a smooth, concrete-like appearance. Organic-Lock Blended Aggregates should be compacted using a single or double drum static roller wherever possible. For tight spaces that are not accessible by drum rollers, a hand tamper is recommended. However, in certain circumstances, a vibratory or plate tamper can be used where the installer deems it to be more effective as hand-tamping over large spaces will create inconsistent results.

Provided the moisture content of the Organic-Lock blended aggregate is adequate, additional hydration should not be necessary. On dry, sunny days, however, the surface layer may start to dry out while installing, in which case, a light misting would be appropriate

to prevent surface cracks from appearing during compaction. Refer to our installation guideline video https://www.youtube.com/watch?v=mzQ-vZu2ynw&list=PL4SwT3V0vLBg_K6VCTUWAuep3zDg_0yCv&index=6&t=4 0s for more information.

3.6 COMPLETING INSTALLATION

A. Apply a light spray to the surface of the material to give a clean appearance. Apply water until the water begins to run-off.

B. Do not allow any traffic on the newly installed pathway until fully cured, a minimum of 24-72 hours.

3.7 REPAIRS AND PROTECTION

3.8 Excavate the damaged area and scarify exposed Organic-Lock Pathway Aggregate.

3.9 Pre-blend the replacement crushed stone aggregate material with Organic-Lock at 28-34 lbs / imperial ton. Apply the material to the excavated area and compact. Thoroughly water the material to achieve an 8-10% moisture content. Use the“snowball test” to determine moisture content - refer to https://www.youtube.com/watch?v=mzQ-vZu2ynw&list=PL4SwT3V0vLBg_K6VCTUWAuep3zDg_0yCv&index=6&t=4 0s for details.

3.10 Allow the newly installed Organic-Lock Pathway Aggregate to cure, but not completely dry out.

3.11 Re-compact the material, ensuring that the final grade and crown are maintained.

3.8 MAINTENANCE

A. All outdoor products require a level of maintenance analysis. It is recommended to do a thorough analysis of your installed Organic-Lock blended aggregate 7 days after installation followed by monthly analysis to ensure no alterations are required.

B. Erosion Damage

1. The greatest element of concern is rainfall erosion. Often, this problem can be greatly reduced by adjusting the watershed areas surrounding the product itself. The best way to determine how the water is building up, is to examine your project area during a rainstorm. Learning where the water is coming from can lead to water diverting that dramatically reduces the stress on your surface.

2. Installing culverts, drains, cross slopes, crowns, or diverters can limit the majority of stress causing damage.

3. If you do experience erosion damage, first look at ways to get the water away or slow the water down, that's causing the damage...secondly, replace the lost material with new material following the guidelines below.

C. Excess Loose Material

1. Directly after the installation, the aggregate surface will be smooth because of the weight of the fresh compaction. As the surface weathers with traffic and time, the larger particles of the aggregate will loosen on the surface to create a natural look and feel which is often sought after. The loose aggregate particles on your surface should not exceed 1⁄4" in depth.

2. Sweeping off the excess particles can be accomplished in areas where excess 1⁄4" chip is not detrimental. These loose particles can also be shoveled and removed from site. The remaining surface will eventually chip loose again, so new material is recommended as a top up (see instructions below) after doing this more than once.

3. If material exceeds a 1⁄4", redistribute the particles over a greater surface, scarify the surface to a depth of 1" and water to a 1" depth and compact with a roller of no less than 1000-lbs. Keep traffic off for 24-72 hours.

D. Removing Debris

1. You can remove grass clippings, soil, debris or organic material by mechanically blowing or hand raking as needed.

E. Snow Plowing

1. When plowing snow, use a shoe lift or rubber baffle on the blade of the plow to lift the blade up 1/4" off the surface. Extra precautions should always be taken after the first snow and last snow of the season, as this is when the material is most prone (i.e. the ground is not frozen).

1.9 ADDING NEW BLENDED ORGANIC-LOCK BLENDED AGGREGATE MATERIAL TO DAMAGED AREAS

A. Below the loose surface particles, the firmed material should be stable to resist erosion and support the intended traffic.

B. If this lower level material incurs damage, we recommend the following:

1. Fixing Lightly Damaged Areas

a. Lightly damaged areas can be repaired by soaking, scarifying with a rake to 1-2 inches and compacting the scarified area using a roller or a hand tamper.

2. Adjusting Organic-Lock Blended Aggregate

a. The Organic-Lock gel activates each time it comes in contact with water, which allows for the blended aggregate to be physically broken up, re-worked and returned back to its initial state. This self-healing nature allows for a simplified maintenance procedure that leaves no sign of the maintenance itself.

b. For example:

If you have to run an irrigation line below your finished pathway, all you need to do is add water, dig the material up, put down your irrigation line, spread the material back in place, then water and compact it using a roller or a hand tamper back to new.

3. Fixing Larger or More Severely Damaged Areas

a. Excavate the damaged area to a depth of 2” to an approximate 50% increase in area (i.e. if your area is in a 4-foot radius circle, excavate a total of 6 feet in diameter.

b. Estimate amount of material lost or material needed to be topped up. Add this amount of preblended Organic-Lock aggregate in the area.

c. Blend this newly blended aggregate in by one of the following methods:

1) Rototill to a Depth of 2 Inches

This needs to be done with multiple passes and should not exceed the depth of the Organic-Lock blended aggregate (i.e. avoid disrupting the base material). Spray the surface with a light spray and begin to till this material to achieve a homogeneous blend of the new and existing material. Add further water as you mix to achieve the optimal snowball (as seen in the snowball test).

2) Remove and Blend the Material Off Site

Add the new Organic-Lock blended aggregate to the existing material on a clean pad. Using a front-end loader (or shovels for smaller projects) mechanically turn the material over until you achieve a homogeneous blend. Add water into this mixture until you achieve an optimal snowball (as seen in the snowball test).

4. Spread this newly blended material back into the area where the excavation was completed and compact using a roller or a hand tamper.

5. Note: Maintenance or patching should not be compacted with a vibratory plate compactor because it will rattle and damage the surrounding cured area.

END OF SECTION 32 15 40

32 17 26
TACTILE WARNING TRUNCATED DOMES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Contractor shall provide all labor, materials, and appurtenances necessary for installation of tactile warning truncated domes as shown in the drawings and specified herein.

1.2 SUMMARY

A. Section Includes:

1. Tactile Warning Truncated Domes

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for curb ramps.

1.3 SUBMITTAL

A. The manufacturer’s product data sheet shall be provided prior to installation.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Tactile dome shall conform to Iron Dome detectable warning plate or approved equal.

1. DOME GEOMETRY In accordance with ADA Regulations for Detectable Warning Surface Products on Curb Ramps:
   a. Raised truncated domes with a diameter of nominal 0.9” (22.9mm),
   b. a height of nominal 0.2” (5.0mm), and a
   c. center-to-center spacing of 1.60”- 2.40” (40.6mm-61.0mm) maximum.

2. UNIT DIMENSIONS:
   a. 12”x24” (304.8mm x 609.6mm) (4 Bolts)
   b. 24”x24” (609.6mm x 609.6mm) (6 Bolts)
   c. 24”x30” (609.6mm x 762.0mm) (8 Bolts)

3. MATERIAL: Gray Iron Casting compliant with ASTM A-159 (G3000), ASTM A48-03, and AASHTO M105-09 (Grade 30B).
   a. Finish: “Natural” ages to Patina

4. PHYSICAL CHARACTERISTICS:
    a. Slip Resistance: 0.93 (Dry), 0.91 (Wet)
    b. Tensile Strength: 34,700 psi

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install per manufacturer's instructions at each carb ramp as located in drawings.

END OF SECTION 32 17 26

32 30 00
SITE IMPROVEMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. These general site work requirements apply to all site work operations and execution requirements.

B. As indicated on Drawings and described in Specifications, the work in this section and its subsections includes but is not limited to:
- site preparation for sidewalks, pads, parking, sport courts, and playgrounds
- site amenities
- backfilling
- soil compaction
- rough and finish grading

C. Implement all pollution prevention plan requirements as set forth in the Storm Water Pollution Prevention Plan with the Notice of Intent (NOI) filed required before work begins.

1.2 QUALITY ASSURANCE

A. Comply with all applicable local, state and federal requirements regarding materials, methods of work and disposal of excess and waste materials.

B. Obtain and pay for all required inspections, permits and fees. Provide notices required by governmental authorities.

1.3 PROJECT CONDITIONS

A. Locate and identify existing underground and overhead services and utilities within contract limit work areas at least 48 hours prior to work. Provide adequate means of protection of utilities and services designated to remain. Repair utilities damaged during site work operations at Contractor's expense.

B. Arrange for disconnection, disconnect and seal or cap all utilities and services designated to be removed before start of site work operations. Perform all work in accordance with the requirements of the applicable utility company or agency involved.

C. When uncharted or incorrectly charted underground piping or other utilities and services are encountered during site work operations, notify the Landscape Architect and applicable utility company(s) immediately to obtain procedure directions. Cooperate with the applicable utility company in maintaining active services in operation. If the services are Owner maintained, notify Owner's Representative immediately.

D. Locate, protect and maintain benchmarks, monuments, control points and project engineering reference points. Re-establish disturbed or destroyed items at Contractor's expense.

E. Perform site work operations and the removal of debris and waste materials to assure minimum interference with streets, walks and other adjacent facilities.

F. Obtain governing authorities' written permission when required to close or obstruct street, walks and adjacent facilities. Provide alternate route around closed or obstructed traffic ways when required by governing authorities.

G. Control dust caused by the work. Dampen surfaces as required. Comply with pollution control regulations of governing authorities.

H. Protect existing buildings, paving and other services or facilities on site and adjacent to the site from damage caused by site work operations. Cost of repair and restoration of damaged items at Contractor's expense.

I. Protect and maintain all:
- signage
- street lights
- utility poles and services
- traffic signal control boxes
- curb boxes
- valves and other services

except those items designated for removal. Provide for temporary relocation when required to maintain facilities and services in operation during construction work. If it is necessary to remove any existing improvements to perform work, the Contractor shall replace them in their existing location and condition or as otherwise directed.

J. Perform site work operations to minimize conflicts and to facilitate Owner's use of the premises and conduct of his normal operations. Take precautions to prevent children from gaining access to work area.

K. Clearing and Grubbing: Remove grass and topsoil designated, by the Drawings, as salvageable to a depth of six (6) inches from the area of construction. Pile topsoil in a location as directed by the Landscape Architect keeping it separate from all other excavated earth. Such designated topsoil shall be mixed with topsoil brought in from off-site and used for finish grading in the areas designated.

PART 2 - EXECUTION

2.1 PREPARATION

A. Examine the areas and conditions under which site work is performed. Do not proceed with the work until conditions are satisfactory.

B. Consult the records and drawings of adjacent work and of existing services and utilities that may affect site work operations.

C. The Contractor is responsible for calling OKIE (800-522-6543 or 405-840-5032) to verify locations of underground utilities prior to beginning any work. The OKIE verification number shall be written on the "as-built" plans.

END OF SECTION 32 30 00

32 84 00
PLANTING IRRIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. It is the intent of the specifications and drawings that the finished system is complete in every respect and shall be ready for operation satisfactory to the owner.

B. The work shall include all materials, labor, services, transportation, and equipment necessary to perform the work as indicated on the drawings, in these specifications, and as necessary to complete the contract.

C. Section Includes:
1. Piping.
2. Manual valves.
3. Automatic control valves
4. Sprinklers
5. Drip irrigation specialties.
6. Controllers and control system.
7. Boxes for automatic control valves.

1.3 DEFINITIONS

A. Circuit Piping: Downstream from control valves to sprinklers, specialties, and drain valves. Piping is under pressure during flow.

B. Main Piping: Downstream from the point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system-pressure.

C. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50V or for remote control, signaling power-limited circuits.

1.4 CONSTRUCTION DRAWINGS

A. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, sleeves, etc. which may be required. The contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting and architectural features.

B. All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications. When an item is shown on the plans but not shown on the specifications or vice versa, it shall be deemed to be as shown on both. The Landscape Architects shall have final authority for clarification.

C. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences, or discrepancies in the area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Landscape Architect as soon as detected. In the event this notification is not performed, the Irrigation Contractor shall assume full responsibility for any revision necessary.

1.5 GUARANTEE

A. The entire sprinkler system, including all work done under this contract, shall be unconditionally guaranteed against all defects and fault of material and workmanship, including settling of backfilled areas below grade, for a period of one (1) year following the filing of the Notice of Completion.

B. Should any problem with the irrigation be discovered within the guarantee period, it shall be corrected by the Contractor at no additional expense to the owner with ten (10) calendar days of receipt of written notice from Owner. When the nature of the repairs as determined by the Owner constitutes an emergency (i.e. broken pressure line) the Owner may proceed to make repairs at the Contractor’s expense. Any and all damages to existing improvements resulting either from faulty materials or workmanship, or from the necessary repairs to correct same, shall be repaired to the satisfaction of the owner by the Contractor, all at no additional cost to the Owner.

C. Guarantee shall be submitted on Contractors own letterhead as follows:

Guarantee for Sprinkler Irrigation System

We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse or neglect excepted. We agree to repair or replace any defective material during the period of one year from date of filing of the Notice of Completion and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the owner. We shall make such repairs or replacements within 10 calendar days following written notification by the owner. In the event of our failure to make such repairs or replacements within the time specified after receipt of written notice from owner, we authorize the owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT NAME:

PROJECT LOCATION:

CONTRACTOR NAME:

ADDRESS:

TELEPHONE:

SIGNED:

DATE:

1.6 PERFORMANCE REQUIREMENTS

A. Irrigation zone control shall be automatic operation with controller and automatic control valves.

B. Location of Sprinklers and Specialties: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards. Maintain 100 percent working head to head irrigation coverage of areas indicated.

C. Minimum Working Pressures: The following are minimum pressure requirements for piping, valves, and specialties unless otherwise indicated:
   1. Irrigation Main Piping: 200 PSI
   2. Circuit (Lateral) Piping: 126 PSI

1.7 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1. The submittals shall include the following information:
    a. A title sheet with the job name, the contractor's name, contractor's address and telephone number, submittal date and submittal number.
    b. An index sheet showing the item number (i.e. 1,2,3 etc.); an item description (i.e. sprinkler head); the manufacturer's name (i.e. Hunter Industries); the item model number (i.e. I-40-ADV/36V); and the page(s) in the submittal set that contain the catalog cuts.
    c. The catalog cuts shall be one or two pages from the most recent manufacturer's catalog that indicate the product submitted. Do submit parts lists, exploded diagrams, price lists or other extra information.
    d. The catalog cuts shall clearly indicate the manufacturer's name and the item model number. The item model number, all specified options and specified sizes shall be circled on the catalog cuts.
    e. Submittals for equipment indicated on the legend without the manufacturer's names, or "as approved", shall contain the manufacturer, Class or Schedule, ASTM numbers and/or other certifications as indicated in these specifications.
        1) Submittal format requirements:
            a) Submittals shall be provided as on complete package for the project. Multiple partial submittals will not be reviewed.
            b) Submittal package shall be stapled or bound in such a way as to allow for disassembly for review processing.
            c) Submittal package shall have all pages numbered in the lower right hand corner. Page numbers shall correspond with submittal index.
2. The Landscape Architect or Owner's authorized representative will allow no substitutions without prior written acceptance.
3. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.
4. The Landscape Architect or Owner's representative will not review the submittal package unless provided in the format described above.

B. Substitutions: If the Irrigation Contractor wishes to substitute any equipment or materials for those equipment or materials listed on the irrigation drawings and specifications, he may do so by providing the following information to the Landscape Architect or Owner's authorized representative for approval.
1. Provide a written statement indicating the reason for making the substitution.
2. Provide catalog cut sheet, technical data, and performance information for each substitute item.
3. Provide in writing the difference and potential savings in installed price if the item is accepted.
4. Estimated schedule impact.

C. Wiring Diagrams: For power, signal, and control wiring.

D. Qualification Data: For qualified installer.

E. Zoning Chart: Show each irrigation zone and its control valve.

F. Controller Timing Schedule: Indicate timing settings, for each automatic controller zone.

G. Field quality-control reports.

H. Operation and Maintenance Data: For sprinklers, controllers and automatic control valves to include in operation and maintenance manuals.
   1. Operation and Maintenance Manuals:
      a. Two individually bound copies of operation and maintenance manuals shall be delivered to the landscape architect or owner's representative at least 10 calendar days prior to final inspection. The manuals shall describe the material installed and the proper operation of the system.
         1) Each complete, bound manual shall include the following information:
            a) Index sheet stating Contractor's address and telephone number, duration of guarantee period, list of equipment including names and addresses of local manufacturer representatives.
            b) Operating and maintenance instructions for all equipment.
            c) Spare parts list and related manufacturer information for all equipment.

1.8 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

C. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

D. Use all means necessary to protect irrigation system materials before, during, and after installation and to protect the installation work and materials of all other trades. In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Landscape Architect and Owner and at no additional cost to the Owner.

E. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings under cover until ready to install. Transport plastic pipe only on a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and concentrated external load.

1.9 PROJECT CONDITIONS

A. The Contractor shall verify and be familiar with the locations, size and detail of points of connection provided as the source of water, electrical supply, and telephone line connection to the irrigation system.
   1. Irrigation design is based on the available static water pressure shown on the drawings. Contractor shall verify static water on the project prior to the start of construction. Should a discrepancy exist, notify the Landscape Architect and Owner's authorized representative prior to beginning construction.
   2. Prior to cutting into the soil, the Contractor shall locate all cables, conduits, sewer septic tanks, and other utilities as are commonly encountered underground and he shall take proper precautions not to damage or disturb such improvements. If a conflict exists between such obstacles and the proposed work, the Contractor shall promptly notify the Landscape Architect and Owner who will arrange for relocations. The Contractor will proceed in the same manner if a rock layer or any other such conditions are encountered.
   3. The Contractor shall protect all existing utilities and features to remain on and adjacent to the project site during construction. Contractor shall repair, at his own cost; all damage resulting from his operations or negligence.
   4. The Irrigation Contractor shall coordinate with the General Contractor for installation of required sleeving as shown on the plans.
   5. The Contractor shall verify and be familiar with the existing irrigation systems in areas adjacent to and within the Project area of work.
   6. The Contractor shall protect all existing irrigation systems, in areas adjacent to and within the project area of work, from damage due to his operations.
   7. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to the requirements indicated:
      a. Notify construction manager no fewer than two working days (48 hours) in advance of proposed interruption of water service.
      b. Do not proceed with interruption of water service without construction manager written permission.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Supply as a part of this contract the following items for each Point of Connection (POC):
   1. Five (5) wrenches for disassembly and adjustment of each type of sprinkler head used in the irrigation system.
   2. Two (2) 5-foot gate valve wrench with a tee handle for operation of valves with a 2" square AWWA operator's nut.
   3. Ten (10) 30-inch sprinkler keys for manual operation of control valves.

4. Two (2) keys for each automatic controller.
5. Ten (10) valve box cover key or wrench.
6. Twenty (20) extra sprinkler heads of each size and type.
7. Drip-Tube System Tubing: Equal to two (2) percent of total length installed for each type and size indicated, but not less than 3,000 feet.

B. The above equipment shall be turned over to Owner's authorized representative at the final inspection.

1.11 25 HDPE PIPE WARRANTY

A. AquaFuse Product Warranty
1. LIMITED WARRANTY: Seller warrants that, for a period of twenty five years from the date of shipment, it will replace any section of CMF Global, AquaFuse HDPE pipe, fittings and valves product that is defective in materials or workmanship, provided that Buyer, upon discovery of a defect, promptly notifies Seller of the defect and, as instructed by Seller at such time, either returns the product to Seller for inspection or allows Seller to inspect at the place of installation. If Seller determines the product to be defective, Seller will provide new product of the same specification and same quantity as the defective product and Seller will bear the expense of freight to deliver the replacement product to the jobsite for domestic projects, and to the closest USA port for foreign projects. Seller does not warrant the installation of product. Any defects introduced after the shipment of product by Seller, whether due to handling, installation or other cause, are not covered by this warranty. This warranty does not cover labor or other costs of installing products. Buyer's sole remedy for defective product shall be to receive replacement product as provided in this Limited Warranty.

2. Other than the above limited warranty, seller makes no warranty and expressly disclaims all other warranties, express or implied, including, but not limited to, the warranties of merchantability and fitness for a particular purpose. Seller's liability arising out of or related to this contract or any product or service supplied by seller (whether such liability is alleged as a breach of contract, breach of warranty, misrepresentation, negligence, indemnification, product liability or otherwise) shall in no event exceed the original purchase price of the defective product plus applicable freight costs actually paid by buyer. Seller will not be liable for any consequential, incidental, special, indirect or punitive damages, loss of profits, loss of business opportunity or other loss even if seller knew or should have known of the possibility of such damages or losses.

B. CONTRACTOR'S WARRANTY
8. LIMITED WARRANTY: Contractor warrants that, for a period of five years (to twenty-five years) from the date of installation, it will re-fuse or repair a fusion connection that is defective in workmanship, provided that Buyer, upon discovery of a defect, promptly notifies Contractor of the defect and, allows the Contractor

to inspect at the place of installation. If it is determined the fused connection to be defective, Contractor will re-fuse or repair the connection at the jobsite. Contractor does not warrant the product itself, only the fused connection. This warranty does not cover labor or other costs, only the fused connection. Buyer's sole remedy for defective connection shall be to receive replacement fusion of the pipe or fitting as provided in this Limited Warranty.

9. Other than the above limited warranty, contractor makes no warranty and expressly disclaims all other warranties, express or implied, including, but not limited to, the warranties of merchantability and fitness for a particular purpose.

10. Contractor's liability arising out of or related to this contract or any product or service supplied by contractor (whether such liability is alleged as a breach of contract, breach of warranty, misrepresentation, negligence, indemnification, product liability or otherwise) shall in no event exceed the original purchase price of the defective connection plus applicable freight costs actually paid by buyer. Contractor will not be liable for any consequential, incidental, special, indirect or punitive damages, loss of profits, loss of business opportunity or other loss even if contractor knew or should have known of the possibility of such damages or losses.

1.12 THIRTY DAY TROUBLE-FREE OPERATION PERIOD

A. Prior to acceptance of the installation by the Owner, the Contractor shall demonstrate a concurrent thirty day, fully automated, uninterrupted daily operation of not less than six hours nor more than ten hours for all systems provided under this Section.

B. The contractor shall supervise the operation of the equipment and be responsible for the proper operation and maintenance thereof and make no claim against the Owner for any damage to the equipment during such operation. The contractor shall make such changes, adjustments, or replacements of equipment as may be required to make the installation comply with the Specifications.

C. The costs of electricity, water and normal operational supplies during the thirty day operation period will be paid by the Owner. The Contractor shall pay for all operating costs resulting from system deficiencies.

D. Coordinate the thirty day operation period with the Electrical Contractor and other trades related to the irrigation work.

PART 2 - PRODUCTS

2.1 PIPES, TUBES AND FITTINGS

A. Pipe shall be marked continuously with manufacturer's name, nominal pipe size, schedule or class, PVC type and grade, National Sanitation Foundation approval, Commercial Standards designation, and date of extrusion.

B. Comply with requirements in the piping schedule for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

C. Pressure supply lines 2 inches in diameter and larger downstream of the point of connection shall be High Density Polyethylene (HDPE) iron pipe size (IPS) pressure rated PE4710, DR 11 (200 PSI rated) conforming to ASTM F714.

D. Non-pressure lateral lines 3/4 inch in diameter and larger downstream of the remote control valve shall be Schedule 40 solvent weld PVC conforming to ASTM D1785. Pipe shall be sized to maintain a velocity in the pipe of less than 4 feet per second at all times.

E. Sleeve carrying pipes and conduits under paving 2 inches in diameter and larger shall be Schedule 40 solvent weld PVC conforming to ASTM D1785.

F. PVC fittings shall be as follows:
   1. Manufactured from PVC compounds conforming to ASTM D1120.
   2. Non-pressure line (lateral line) fittings shall be Schedule 40 PVC conforming to ASTM D2466.
   3. All threaded PVC fittings, regardless of where used, shall be Schedule 80 PVC conforming to ASTM D2464.
   4. PVC Unions: Shall be Schedule 80 PVC with socket inlets and MIPT or FIPT outlet as shown.

2.2 HDPE PIPE AND FITTINGS

A. Pressure supply lines 2 inches and diameter and larger downstream of the backflow prevention unit shall be DR 11 (202 PSI rated) high density polyethylene (HDPE) pipe manufactured from PE 4710 resin compound.

B. Pipe and tubing shall be manufactured from a PE4710 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The PE 4710 resin material will meet the specifications of ASTM D 3350-09 with a minimum cell classification of PE 445474C. Pipe shall be manufactured to the dimensions and requirements of ASTM F714. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All HDPE pipe shall be in straight lengths or coils.

C. The physical properties of the HDPE material shall conform to the ASTM 3340-09 allowable values as shown below.

For Cell Class 445474C	Specifications	Allowable Values	Typical Values
Density (g/cm^3)	ASTM D 1505	>0.9555	>0.961
Melt index (g/min)	ASTM D 1238	<0.150	<0.150
Flexural Modulus (PSI)	ASTM D 790	110,000 t0 <160,000	125,000
Tensile Strength at Yield (PSI)	ASTM D 638	3,500 to <4,000	3650
Slow Crack Growth Resistance Pent (Hours)	ASTM F 1473	500	>500
Hydrostatic Design At 73.4° F PSI	ASTM D 2837	1,600/1000	1,600/1,000
Black Color UV Stabilizer	ASTM D 3350	Min. 2%	Avg. 2.25%

D. The HDPE pipe shall be AquaFuse as supplied for CMF Global (740) 953-0589) or equal.

E. HDPE pipe lengths shall be joined using a butt fusion method approved by the manufacturer of the HDPE pipe, the Irrigation Consultant and the Owner's Authorized Representative. Electro fusion fittings shall be acceptable only in areas where butt fusion is impractical due to site conditions.

F. Butt Fusion Fittings - Fittings shall be PE 4710 with a minimum cell classification of PE 445474C. Butt Fusion molded Fittings shall have a manufacturing standard of ASTM D3261. Molded & fabricated fittings shall have the same minimum pressure rating as the pipe unless otherwise specified on the plans. Fabricated fittings are to be manufactured to meet the FM (Factory Mutual) performance standards. Fabricated fittings are to be manufactured using a Data Logger. Reference to the Data Logger quality control records should be referenced from an indented stamp in each fusion bead of each fitting. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records.

G. Flanged and Mechanical Joint Adapters - Flanged and Mechanical Joint Adapters shall be PE 4710 resin with a minimum cell classification of PE 445474C. Flange adapters and Mechanical Joint Adapters shall have the same pressure rating as the pipe unless otherwise specified on the plans.

H. The HDPE supplier must be capable of supplying both the pipe and fittings. The supplier must have the capability to train the contractor's employees in butt fusion, electro-fusion, socket fusion, sidewall saddle fusion and compatible fusion of HDPE pipe and fittings. The supplier must be capable of providing a "Fusion Technical Hot Line", (740)-953-0589, to assist in fusion and fusion equipment questions. The supplier must be capable of providing a trained representative on site upon the request of the contractor, owner or consultant to address any problems that are encountered during the installation. The supplier must furnish a written 25 year limited Warranty for HDPE pipe fittings and valves Golf, Turf and Commercial Irrigation applications as provided by CMF Global.

I. The HDPE pipe shall be AquaFuse as supplied for CMF Global (hot line) or equal. Recommended HDPE pipe and fitting supplier: CMF Global.

2.3 PIPING AND JOINT MATERIALS

A. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

1.4 BOOSTER PUMP AND FILTRATION

A. The booster pump for the irrigation system shall be the exact manufacturer, size, and type indicated on the drawings.

B. The automatic filtration system for the irrigation system shall be the exact manufacturer, size, and type indicated on the drawings.

C. The booster pump and filtration system shall be provided as a package from the same manufacturer and include all pump equipment, filter equipment and control panels.

2.5 MANUAL VALVES

A. Gate Valves for Mainline Isolation:
   1. Gate valves shall be of the manufacturer, size, and type indicated on the drawings.
   2. Gate valves shall be resilient wedge type conforming to AWWA standards.
   3. Gate valves shall be constructed of a ductile iron body, gate and stem. Gate valves shall have bell or spigot connections allowing connection to both HDPE and PVC pipes.
   4. Gate valves shall have a minimum working pressure of not less than 150 PSI and shall conform to AWWA standards.
   5. Gate valves shall be sized to match the HDPE mainline size on which they are installed.

B. Ball Valves for Manifold Isolation:
   1. Ball valves shall be of the manufacturer, size, and type indicated on the drawings.
   2. Ball valves shall be Sch. 80 PVC and equipped with a slow-closing device.
   3. Ball valves shall have HDPE tail pieces on each end to allow for a fused connection to the HDPE manifold mainline.
   4. Ball valves shall be 2” size.

C. Quick Coupling Valves:
   1. Quick coupling valves shall be of the manufacturer, size, and type indicated on the drawings.
   2. Quick coupling valves shall be 1” size and constructed of a brass body, and a locking vinyl cover.
   3. Quick coupling valve swing joint shall be a manufactured PVC swing joint with a specialty HDPE to PVC fitting on the inlet, o-rings on the swiveling parts, and a MIPT brass outlet.

D. Air Release Valves:
   1. Air release valves shall be of the manufacturer, size, and type indicated on the drawings.
   2. Ball valve for use on the air release valve shall be a brass and stainless steel unit with a stainless steel handle.

2.6 AUTOMATIC CONTROL VALVES AND EQUIPMENT

A. Brass and Plastic, Master Control Valves:
   1. Master valves shall be of the manufacturer, size, and type indicated on the drawings.
   2. Master control valves shall have brass body, plastic bonnet, stainless steel and brass trim, and chlorine resistant rubber internal components.
   3. Master control valves shall be normally closed, diaphragm type with manual-flow adjustment, internal filter protection, and operated by 24V ac solenoid.

B. Plastic, Remote Control Valves:
   1. Remote control valves shall be of the manufacturer, size, and type indicated on the drawings.
   2. Remote control valves shall have fiberglass reinforced nylon bodies, stainless steel and brass trim, and chlorine resistant rubber internal components.
   3. Remote control valves shall be normally closed, diaphragm type with manual-flow adjustment, internal filter protection, and operated by 24V ac solenoid.
   4. Remote control valves shall have an adjustable pressure regulator to control the downstream water pressure during operation.

C. Flow Sensor:
   1. Flow sensor shall be of the manufacturer, size, and type indicated on the drawings.
   2. Flow sensor shall have a PVC TEE body, a nylon impeller and epoxy potted electronics.
   3. Flow sensor shall be of the same manufacturer as the irrigation controller.

1.7 CONTROLLERS AND CONTROL SYSTEM

A. Controllers shall be of the manufacturer, model, size and features of this control system shall be as indicated on the materials legend.

B. Controller Description:
   1. Controller shall be a two-wire (Decoder) type controller capable of controlling up to 200 individual zones.
   2. Controller shall be installed inside a stainless steel pedestal enclosure.
   3. Controller shall have three two wire paths as follows:
      a. A two wire path from the master valve / flow sensors associated with the controller to the controller.
      b. A two-wire path from the controller to the control valves associated with the controller.

C. Decoders: All remote control valves shall be connected to a decoder to the two-wire path. decoders may be single or multiple station units capable of control of two or four remote control valves. Decoders shall be of the manufacturer, model, and size as indicated on the materials legend.

D. A decoder programming tool shall be provided for the project.

E. The control system shall include the communications components to communicate with an Internet based control system. The control system shall include daily evapotranspiration downloads and full central control capabilities.

F. Rain sensor shall be a wireless unit of the manufacturer, size, and type indicated on the drawings,

G. System Grounding: The central control system two-wire paths shall be grounded using a line surge protector and grounding plate or rod. Line surge protectors and grounding plates or rods, shall be of the manufacturer, model, and size as indicated on the materials legend.

H. Two-wire Path: Wires shall be two #14UF AWG direct burial wires manufactured as a parallel pair and encased inside a heavy duty, color coded, polyethylene jacket. Two-wire path shall be of the manufacturer, model, size, and color coding as indicated on the materials legend.

I. Waterproof wire connections shall be of the manufacturer, size and type indicated on the drawings.

2.8 SPRINKLERS

A. General Requirements: Designed for uniform coverage over entire spray area indicated at available water pressure.

B. Plastic, Pop-up, Gear-Drive Rotary Sprinklers:
   1. Single nozzle, single stream type with rotating turret to deliver water to arc angles between 45 and 360 degrees.
   2. Description:
      a. Body Material: ABS.
      b. Pop-up Height: 6” in turf areas, 12” in shrub areas.
      c. Nozzle: Plastic, Size per Plan.
      d. Retraction Spring: Stainless steel.
      e. Riser stem: Plastic or stainless steel as indicated.
      f. Internal Parts: Corrosion resistant.
      g. Pattern: Adjustable arc with radius adjustment.
      h. Pressure Regulation: None.
   3. Rotor head shall be of the manufacturer, model, size and type indicated on the materials legend.

2.9 IRRIGATION EQUIPMENT BOXES

A. Plastic Boxes:
   1. Master control valves, flow sensors, gate valves, ball valves, quick coupling valves, remote control valves, ground rods, and spare wires shall be installed below grade in a plastic box.
   2. Valve boxes shall be of the manufacturer, model, size and type indicated on the materials legend.
   3. Valve Box Description:
      a. The cover and box shall be capable of sustaining a load of 1,500 pounds.
      b. Valve box extensions shall be by the same manufacturer as the valve box.
      c. The plastic irrigation valve box cover shall be an overlapping ‘T’ type.
      d. Boxes requiring bolt down cover shall be equipped with stainless steel bolt, washer and captive nut as manufactured by the box manufacturer.
      e. Box bodies shall be black in color. Box lids shall be dark green in color when installed in turf areas. Box lids shall be black in color when installed in shrub and ground cover areas.
   4. Sizes:
      a. Master valves, flow sensors, remote control valves, and wire splices (pull box) shall be installed inside a standard sized rectangular valve box (21.8” L x 16.6" W x 12.0" H) with a bolt down cover.
      b. Gate valves, ball valves, quick coupler valves and ground rods shall be installed inside a standard sized round valve box (9.9” D x 9.0" H) with a bolt down cover.

B. Landscape Fabric:
   1. Landscape fabric for valve box assemblies shall be 5.0- oz. weight woven polypropylene weed barrier. Landscape fabric shall have a burst strength of 225 PSI, a puncture strength of 60 lbs. and capable of water flow of 12 gallons per minute per square foot.
   2. Type: DeWitt Pro 5 Weed Barrier or approved equal.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

B. Provide minimum cover over top of underground piping according to the following:
   1. Irrigation Main Piping: Minimum depth of 24 inches below finished grade.
   2. Circuit Piping: 12 inches (300 mm)
   3. Sleeves: Per Plan Details.

3.2 PREPARATION

A. Set stakes to identify locations of proposed irrigation system valves and major equipment. Obtain Landscape Architect or Owner's Authorized Representatives approval before excavation.

3.3 PIPING INSTALLATION

A. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings.

B. During loading, transportation and unloading, every precaution shall be taken to prevent injury to the pipe. No pipe shall be dropped from cars or trucks, or allowed to roll down slides without proper retaining ropes. During transportation pipe shall rest on suitable pads, strips, skids or blocks securely wedged or tied in place. Any pipe damaged shall be replaced.

C. Carefully inspect all pipe and fittings before installation, removing dirt, scale, burrs, and reaming. Install pipe with all markings up for visual inspection and verification. Pipe shall not exhibit scratches or gouges greater than acceptable to the Owner or Irrigation Consultant. Defective, damaged or unsound pipe will be rejected and removed from the site.

D. Install fittings for changes in direction and branch connections. HDPE pipe may be installed in a curved fashion to eliminate fittings at directional changes. Manufacturers recommendations on minimum pipe bend diameter shall be followed.

E. HDPE and PVC pipes shall be installed in a manner, which will provide for expansion and contraction as recommended by the pipe manufacturer.

F. Install underground thermoplastic piping according to ASTM D 2774 and ASTM F 690.

G. Install PVC piping in dry weather when temperature is above 40 deg F. Allow joints to cure at least 24 hours at temperatures above 40 deg F before testing.

H. Install piping in sleeves under parking lots, roadways, and sidewalks.

3.4 BACKFILLING

A. Backfill material on all lines shall be the same as adjacent soil free of debris, litter, and rocks over 1/2 inch in diameter.
   1. Backfill shall be tamped in 4-inch layers under the pipe and uniformly on both sides for the full width of the trench and the full length of the pipe. Backfill materials shall be sufficiently damp to permit thorough compaction, free of voids. Backfill shall be compacted to dry density equal to adjacent undisturbed soil and shall conform to adjacent grades.
      a. Flooding in lieu of tamping is not allowed.
      b. Under no circumstances shall truck wheels be used to compact backfill.
   2. Provide sand backfill a minimum of 4 inches over and under all piping under paved areas.

3.5 JOINT CONSTRUCTION

A. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
   1. Plain-End PE Pipe and Fittings: Use butt fusion.
   2. After fusing of the joint, using a white Sharpie pen, write the date and time of the joint fusing and the operator's initials clearly onto one side of the joint.

B. HDPE pipe shall be joined using a butt fusion method approved by the manufacturer, the Irrigation Consultant and the Owner's Authorized representative. The Contractor shall provide all necessary equipment and certified operators for the joining and installation of HDPE pipes.

C. Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground, whenever possible. The joining method shall be the butt fusion and or socket fusion method and shall be performed in strict accordance with the pipe supplier's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe supplier, including, but not limited to, temperature requirements of 425 +/- 15 degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75 +/- 15 psi for hydraulic. The fusion equipment used shall be manufactured by McElroy Manufacturing, or equal. The butt fusion joining will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself.

D. After fusing of the joint, using a white Sharpie pen, write the date and time of the joint fusing and the operator's initials clearly onto one side of the joint.

E. Electro-fusion or socket fusion (500˚F +/-25 may be used where the butt fusion method cannot be used. Electro-fusion couplings and fittings shall be PE 4710 with a minimum cell classification of PE 445474C. Electro-fusion couplings or fittings shall have a manufacturing standard of ASTM F1055. Couplings and fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.

F. TESTING if pressure testing is required testing shall be done hydrostatically. For detailed testing information contact The AquaFuse irrigation Hot Line at (740-953-0589).

G. Quality Control Testing (On Site Bend Back Test)
   1. Prior to HDPE pipe being installed in the trench, at the beginning of the job, the contractor shall cut out the first butt fusion of each pipe size. The contractor shall prepare the sample for the test in accordance with the "Bend Back Testing" procedure in accordance with ASTM F 2620.
   2. The samples shall be tested in the presence of the owner's representative and / or the irrigation consultant, all in accordance with testing procedures outlined. All samples shall be labeled and saved. Testing must be done at 73 degrees F plus or minus 5 degrees. The test temperature and sample size are critical to testing. The purpose of the test is to determine if the weld meets specified standards. A pass means no failures during the bend back test. This means a good weld. A break means a bad weld. Any failure shall require additional testing.

H. PVC Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. PVC Non-pressure Piping: Join according to ASTM D 2855.

3.6 BOOSTER AND AUTOMATIC FILTER

A. The booster pump and automatic filtration system shall be installed below grade in valve boxes as indicated in the detailed drawings.

B. The booster pump and automatic filter system shall be installed as recommended and required by the manufacturer.

C. The booster pump and control system shall be set up to operate as required by the irrigation system and the manufacturer of the systems.

D. The contractor shall arrange, pay for and provide proof that the booster pump and automatic filter system has been inspected, approved and certified by the manufacturer.

3.7 VALVE INSTALLATION

A. All valves shall be installed below grade in valve boxes as indicated in the detailed drawings.

B. All components indicated in the detail drawings shall be considered required by the assembly and shall be installed as shown.

C. All valves shall be staked out for review by the landscape Architect or Owner's Authorized representative prior to the mainline trenching and installation. Adjustment to the installation location of the valves shall be made at no additional cost to the Owner.

3.8 CONTROLLER AND CONTROL SYSTEM

A. Equipment Mounting: Install exterior controllers in pedestals.

1. Install controllers in the manufacturer supplied pedestals.

2. Install pedestals on the concrete mounting pads.

B. Install control cable in same trench as irrigation mainline piping and at least 2 inches beside mainline piping. Provide conductors of size not smaller than recommended by controller manufacturer. Install cable in separate sleeve under paved areas.

C. All system decoders shall be installed and addressed to the controller as recommended by the manufacturer. The decoder programming unit shall be used to address the decoders to the controller.

D. All controller and two-wire path grounding shall be installed and tested to provide the manufacturer's recommended grounding requirements.

E. The contractor shall program the irrigation control system to operate through the central control system including automatic control adjustment through the use of the system moisture sensors.

F. The rain sensor shall be installed and tested for accurate radio communication between the sensor and the controller. If required, the sensor shall be relocated to provide communication.

3.9 SPRINKLER INSTALLATION

A. Sprinklers shall be installed as indicated in the detailed drawings.

B. Height or sprinklers above grade, distance from hardscape features, walls and buildings shall be as indicated on the detailed drawings.

C. Flush all lateral lines with water prior to the installation of the heads and nozzles.

D. Adjust nozzles to provide complete coverage to the landscaped area without overspray onto buildings, walls or adjacent hardscape areas.

E. Minor adjustment of head layout may be required at the coverage test and shall be performed at no additional cost to the Owner.

F. Tree bubblers shall be installed as indicated in the detail drawings and the streams adjusted to prevent water from hitting the trunks of the tree.

3.10 FIELD QUALITY CONTROL

A. Provide at least one English speaking person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the manufacturer's recommended methods of installation and who shall direct all work performed under this section.

B. Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturer of articles used in this contract furnish directions covering points not shown in the drawings and specifications.

C. All local, municipal, and state laws, rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.

D. All materials supplied for this project shall be new and free from any defects. All defective materials shall be replaced immediately at no additional cost to Owner.

E. The Contractor shall secure the required licenses and permits including payments of charges and fees, give required notices to public authorities, verify permits secured or arrangements made by others affecting the work of this section.

3.11 INSPECTIONS

A. The Contractor shall permit the Landscape Architect and Owner's authorized representative to visit and inspect at all times any part of the work and shall provide safe access for such visits.

B. Where the specifications require work to be tested by the Contractor, it shall not be covered over until accepted by the Landscape Architect, Owner's authorized representative, and/or governing agencies. The Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing. Should any work be covered without testing or acceptance, it shall be, if so ordered, uncovered at the Contractor's expense.

C. Inspections will be required for the following at a minimum:

1. System layout
2. Pressure test of irrigation mainline (Two hours at 125 PSI or 120% of static water pressure, whichever is greater.) Mainline pressure loss during test shall not exceed 3 PSI.
3. Coverage test of irrigation system. Test shall be performed prior to any planting.
4. Final inspection prior to start of maintenance period.

5. Final acceptance.

D. Site observations and testing will not commence without the field record drawings as prepared by the Irrigation Contractor. Record drawings must complete and up to date for each site visit.

E. Work that fails testing and is not accepted will be retested. Hourly rates and expenses of the Landscape Architect, Owner's authorized representative, and governing agencies for re-inspection or retesting will be paid by the Irrigation Contractor at no additional expense to Owner.

F. Any irrigation product will be considered defective if it does not pass tests and inspections.

3.12 ADJUSTING

A. Contractor shall adjust valves, align heads, and check the coverage of each system prior to coverage test.

B. If it is determined by the Landscape Architect or Owner's authorized representative that additional adjustments or nozzle changes will be required to provide proper coverage, all necessary changes or adjustments shall be made prior to any planting.

C. The entire system shall be operating properly before any planting operations commence.

D. Automatic control valves are to be adjusted so that the irrigation heads and drip tubing operate at the pressure recommended by the manufacturer.

E. Adjust sprinklers so they will be flush with, or not more than 1/2 inch above, finish grade.

3.13 CLEANING

A. Prior to installation of irrigation heads, the valves shall be opened and a full head of water used to flush out the lines and risers.

B. Irrigation heads shall be installed after flushing the system has been completed.

3.14 DEMONSTRATION

A. Do not allow or cause any of the work of this section to be covered up or enclosed until it has been observed, tested and accepted by the Landscape Architect, Owner, and governing agencies.

B. The Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing.

C. When the sprinkler system is completed, the Contractor shall perform a coverage test of each system in its entirety to determine if the water coverage for the planted areas is complete and adequate in the presence of the Landscape Architect.

D. The Contractor shall furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from the plans, or where the system has been willfully installed as indicated on the drawings when it is obviously inadequate, without bringing this to the attention of the Landscape Architect. This test shall be accepted by the Landscape Architect and accomplished before starting any planting.

E. Final inspection will not commence without record drawings as prepared by the Irrigation Contractor.

3.15 MAINTENANCE

A. During the maintenance period the Contractor shall adjust and maintain the irrigation system in a fully operational condition providing complete irrigation coverage to all intended plantings.

3.16 COMPLETION CLEANING

A. Clean up shall be made as each portion of the work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broomed, and any damage sustained on the work of others shall be repaired to original conditions.

B. Dispose of waste, trash, and debris in accordance with applicable laws and ordinances and as prescribed by authorities having jurisdiction. Bury no such waste material and debris on the site. Burning of trash and debris will not be permitted. The Contractor shall remove and dispose of rubbish and debris generated by his work and workmen at frequent intervals or when ordered to do so by the Owner's authorized representative.

C. At the time of completion, the entire site will be cleared of tools, equipment, rubbish and debris which shall be disposed of off-site in a legal disposal area.

3.17 TURNOVER ITEMS

A. Record Drawings:

1. Record accurately on one set of drawings all changes in the work constituting departures from the original contract drawings and the actual final installed locations of all required components as shown below.

2. The record drawings shall be prepared to the satisfaction of the owner. Prior to final inspection of work, submit record drawings to the Landscape Architect or Owner's authorized representative.

3. All record drawings shall be prepared using AutoCAD 2010 drafting software and the original irrigation drawings as a base. No manual drafted record drawings shall be acceptable. The Contractor may obtain digital base files from the Landscape Architect or Owner's authorized representative.

4. If the Contractor is unable to provide the AutoCAD drafting necessary for the record drawings the irrigation designer does provide record drawing drafting as a separate service.

5. Prior to final inspection of work, submit record drawings plotted sheets for review by the Landscape Architect or Owner's authorized representative. After acceptance by the Landscape Architect, City Inspector or Owner’s authorized representative re-plot the record drawings onto reproducible Mylar sheets. The Contractor shall also provide record drawing information on a digital AutoCAD Release 2010 drawing file. All digital files shall be provided on a compact disc (CD) clearly marked with the project name, file descriptions and date.

a. Record drawing information and dimensions shall be collected on a day-to-day basis during the installation of the pressure mainline to fully indicate all routing locations and pipe depths. Locations for all other irrigation equipment shall be collected prior to the final inspection of the work.

b. Two dimensions from two permanent points of reference such as buildings, sidewalks, curbs, streetlights, hydrants, etc. shall be shown for each piece of irrigation equipment shown below. Where multiple components are installed with no reasonable reference point between the components, dimensioning may be made to the irrigation equipment. All irrigation symbols shall be clearly shown matching the irrigation legend for the drawings. All lettering on the record drawings shall be minimum 1/8 inch in size.

c. Show locations and depths of the following items:

1) Point of connection (including water POC, backflow devices, master control valves, flow sensors, etc.)

2) Routing of sprinkler pressure main lines (dimensions shown at a maximum of 100 feet along routing.)

3) Isolation valves.

4) Automatic remote control valves (indicate station number and size.)

5) Quick coupling valves.

6) Drip air relief and flush valves.

7) Routing of control wires where separate from irrigation mainline.

8) Irrigation controllers (indicate controller number and station count)

9) Related equipment (as may be directed)

a) Provide one controller chart for each automatic controller. Chart shall show the area covered by the particular controller. The areas covered by the individual control valves shall be indicated using colored highlighter pens. A minimum of six individual colors shall be used for the controller chart unless less than six control valves are indicated.

b) Landscape Architect or Owner's authorized representative must approve record drawings before controller charts are prepared.

c) The chart is to be a reduced copy of the actual "record" drawing. In the event the controller sequence is not legible when the drawing is reduced, it shall be enlarged to a readable size.

d) When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 20 mils in thickness.

B. Spare Parts:

The contractor shall turn over the following spare parts upon completion of the installation.

1. Ten (10) additional sprinkler heads of each size and type used.
2. Ten (10) additional spray and bubbler nozzles of each size, arc and type used.
3. Two (2) additional remote control valves of each size used.
4. Five (5) additional quick coupler valves.
5. Ten (10) quick coupler keys.
6. Four (4) five-foot-long, steel operating keys for the mainline gate valves.
7. Five (5) 30-inch-long valve operating keys for the manifold ball valves.
8. Two (2) two keys for each controller enclosure and controller cabinet.
9. Ten (10) single station valve decoders.
10. Two (2) line surge arrestors.
11. The decoder programming unit.

3.18 COMPLETION

A. At the time of the pre-maintenance period inspection, the Landscape Architect, Owner's authorized representative, and governing agencies will inspect the work, and if not accepted, will prepare a list of items to be completed by the Contractor. Punch list to be checked off by contractor and submitted to Landscape Architect or Owner's Authorized representative prior to any follow-up meeting. This checked off list to indicate that all punch list items have been completed. At the time of the post-maintenance period or final inspection the work will be re-inspected and final acceptance will be in writing by the Landscape Architect, Owner's authorized representative, and governing agencies.

B. The Owner's authorized representative shall have final authority on all portions of the work.

C. After the system has been completed, the Contractor shall instruct Owner's authorized representative in the operation and maintenance of the irrigation system and shall furnish a complete set of operating and maintenance instructions.

D. Any settling of trenches which may occur during the one-year period following acceptance shall be repaired to the owner's satisfaction by the Contractor without any additional expense to the owner. Repairs shall include the complete restoration of all damage to planting, paving or other improvements of any kind as a result of the work.

END OF SECTION 32 84 00

32 92 00
TURF AND GRASSES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Perform sodding work in areas designated on drawings and areas distributed by construction.

1.2 QUALITY ASSURANCE

A. Sod shall comply with the American Sod Producer's Publication.

1.3 SECTION REQUIREMENTS

A. Submittals: Verification of species from grower; identify source location.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding."

C. Maintain sod until project receives final acceptance.

1.4 DELIVERY, STORAGE AND HANDLING

A. Sod to have following characteristics during delivery and handling:

1. Shall be transplanted within 24 hours after sod is stripped

2. If stacked, it shall be placed roots to roots, or grass to grass.

3. Shall be kept moist during delivery and protected from wind, sun, dehydration, and freezing

4. Shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected

5. Shall not be dumped from vehicles

B. Damaged sod will be rejected.

PART 2 - PRODUCTS

2.1 GRASSES

A. Turfgrass Sod. Provide strongly rooted sod free of weeds, undesirable grasses, stones, and roots. Provide sod in uniform color, leaf texture and density, and extraneous materials, capable of growth and development when planted, composed principally of the following:

1. 'U-3' Bermuda Grass (Cynodon dactylon)

2.2 SOILS AND AMENDMENTS

A. Topsoil: ASTM D 5268, with pH range of 5 to 7, free of stones ½ inch (12.5 mm) or larger and other extraneous materials harmful to plant growth.

B. Compost: Well-composted, mature, stable, and weed-free organic matter; pH range of 5 to 7.

C. Commercial Fertilizer: Commercial-grade complete fertilizer, consisting of 1 lb/1000 sq. ft. (0.5 kg/100 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight. (To determine the amount of a particular fertilizer needed to supply 1 pound of actual nitrogen per 1,000 square feet, divide the percentage of nitrogen in the fertilizer into 100.)

D. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium; 10 percent nitrogen; 20 percent phosphorous; and 10 percent potassium; by weight. Fertilizer to be delivered to the site in fully labeled bags/containers bearing the trade name and manufacturer's guaranteed statement of analysis.

PART 3 - EXECUTION

3.1 PREPARATION

A. Rake or disc-scar to loosen subgrade to a minimum depth of 4 inches (100 mm); remove stones, sticks, existing grass, vegetation, and other extraneous materials.

1. At unchanged grades, apply soil amendments and fertilizers according to specifications. Rake and smooth soil to a smooth, even surface with loose, uniformly fine texture.

B. Grade lawn areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Moisten before planting.

3.2 INSTALLATION

A. Planting Restrictions: Plant during one of the following periods:

1. Spring Planting: April 15 – May 31

2. Fall Planting: August 31 – October 31

B. Perform sodding work after all work affecting groundwork has been completed.

C. Lay sod within 24 hours of harvesting. Do not install on saturated or frozen soil. Lay sod with tightly fitted joints, offsetting joints in adjacent courses. Fill minor cracks between pieces of sod with soil or sand. On slopes exceeding 1:6, lay sod in horizontal courses, alternating seams, and anchor with wood pegs or steel staples. Water sod thoroughly immediately after planting.

D. Erect warning signs or barriers as necessary to protect sodded areas against damage.

3.3 INITIAL ACCEPTANCE

A. At the request of the Contractor, the Landscape Architect will review the sodding installation. Initial acceptance will occur at substantial completion providing all sod is in place, healthy, and meets specifications.

3.4 ESTABLISHMENT AND MAINTENANCE PERIOD

A. Maintain sod during establishment as required for optimum growth until project receives final acceptance.

B. Establish lawn by watering for the first 2 weeks after installation, ¼" every day in the absence of rain. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn. Provide materials and installation specifications the same as those used in the original installation.

1. Provide all self-contained watering equipment (such as truck or "water buffalo") as needed, to irrigate newly installed sod.

2. Utilize domestic water supply on park property (when available) at no cost to Contractor. Coordinate use with Public Works.

3. Water used from fire hydrants shall be at the expense of Contractor.

4. Contractor is responsible for verifying source of water prior to bidding.

C. After the first 2 weeks of establishment, water less frequently and apply greater amounts of water during each irrigation to saturate the soil. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn. Provide materials and installation specifications the same as those used in the original installation.

D. Mow lawn as soon as top growth is 1 ½ times the desired mowing height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Do not remove clippings unless clumping occurs.

E. Remove excess waste material daily.

3.5 FINAL ACCEPTANCE

A. When sodding is substantially completed, including the maintenance period, Owner's Representative will, upon request, make an inspection to determine acceptability.

B. Sodded lawns will be acceptable provided requirements, including maintenance, have been complied with and a healthy, uniform, close stand of specified grass is established free of weeds, bare spots, and surface irregularities.

C. When inspected work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by Owner's Representative and found acceptable.

D. Upon final acceptance, Owner will assume lawn maintenance.

END OF SECTION 32 92 00

32 93 00
TREES, SHRUBS, AND GROUND COVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:

1. Locating, purchasing, and delivering plants.
2. Planting trees, shrubs, ground cover.
3. Organic mulch.
4. Tree stabilization.

B. Related Sections include:

1. Division 31 Section Excavation Backfilling and Compaction
2. Division 32 Section Turf and Grasses

1.3 REFERENCED STANDARDS

A. The following are referred to in this section:

1. "ANSI Z60.1 American Standard for Nursery Stock", Current Edition, American Association of Nurserymen.
2. "ANSI A300 Standards for Tree Care Operations", Current Edition, American National Standards Institute.
3. "USDA Cold Hardiness System" United States Department of Agriculture published zone map.
4. "Structural Pruning: A Guide For The Green Industry" current edition; published by Urban Tree Foundation, Visalia, California.
5. Glossary of Arboricultural Terms, International Society of Arboriculture, Champaign IL, current edition.
6. "ASTM D-3385-09 Infiltration Testing".

1.4 DEFINITIONS

A. General Nomenclature:

1. Balled and Burlapped (B&B) Stock: Trees grown in filed soil for at least 12 months dug with firm, natural balls of earth in which they are grown, wrapped in burlap and/or wire. B&B trees shall be "heeled-in" or "cured" between 6 and 52 weeks.

2. Balled and Potted Stock: Trees dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container and established for at least 12 months before planting on site.

3. Bare-Root Stock: Trees with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed.

4. Clear Trunk or Branching Height: The portion of the lower trunk maintained free of any branches measured from the top of root ball to the underside of the first lowest permanent branch.

5. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container or box. H. Crown Spread or Diameter: the average diameter of the widest portion of the crown and that diameter perpendicular to it.

6. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted trees established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag.

7. Hardened Off: Plants that have be gradually acclimated from their previous growing conditions to conditions on site. K. Included Bark: Bark between a branch and trunk or between trunks that is squeezed together in the crotch of the branch resulting in a weak branch union. Non-conforming Plant: Any plant that fails to meet the requirements of this specification.

8. Root Ball Diameter: The average diameter of the widest portion of the root ball and that diameter measured perpendicular to it. Root Collar (root crown, root flare, trunk flare, flare): The region at the base of the trunk where the majority of the structural roots join the plant stem, usually at or near ground level.

9. Trunk Wound: A trunk injury that is open and not callused over. A properly executed pruning cut that has yet to close over is not considered a trunk wound.

10. Finish Grade: Elevation of finished surface.

11. Plant, Plants, Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

12. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

13. Stem Girdling Roots: Any root more than 1 inch diameter currently touching the trunk, or with the potential to touch the trunk, above the root collar approximately tangent to the trunk circumference or circling the trunk. Roots shall be considered as Stem Girdling that have, or are likely to have in the future, root to trunk bark contact.

14. Structural root: One of the largest roots emerging from the root collar.

1.5 MEASUREMENT, GRADING & QUANTITIES

A. Time: The specified sizes and grades shall be at the time of delivery to site. Any assessment or measurement before this time can only be based on the plant characteristics at that time and not any future or predicted growth potential of the plant.

B. Size: The measurements specified or referenced shall be the minimum sizes acceptable after any necessary pruning and with branches, trunks or canes in their normal position.

   1. Plants that meet measurements specified but do not possess a normal balance between height and spread shall be rejected.

   2. Plants larger than specified may be used if approved. If larger plants are approved by the Project Site Representative, increase the root ball size in proportion to the size of the plant at no additional cost to The Owner.

C. Quantity: If there is a discrepancy between the number of plants drawn and the number of plants listed or noted, then the number of plants drawn shall take precedence.

1.6 PERFORMANCE REQUIREMENTS

A. Plant Supply: Supply scheduled plant species, quantities, sizes, and quality on the dates required.

B. Sourcing and Growing Methods: Be responsible for all the means and methods of supplying the plants.

1.7 SUBMITTALS

A. Qualification Data for Plant Suppliers and/or Growers: Include list of similar projects completed by growers demonstrating their capabilities and experience in the last five years.

   1. Include project names, addresses, and year completed, and include contact information of personnel as references.

B. Qualification Data for Plant Installer: Include list of similar projects completed by Installer demonstrating their capabilities and experience in the last five years.

   1. Include project names, addresses, and year completed, and include contact information of personnel as references.

C. Supply Problems & Substitutions: Submit immediate notice of any supply difficulties and substantiate if any material specified is not obtainable including copies of grower's correspondence.

   1. Submit in writing to the Landscape Architect no later than twenty-one days after the Notice to Proceed any proposed plant substitutions of equivalent size and/or variety with corresponding proposed adjustment of the Contract Price. Substitutions shall not be considered after this time.

D. Proof of Supply: Submit proof of holding/deposit/purchase agreements from growers for the following:

   1. Grower's nursery/plantation name and address.

   2. Nursery/plantation layout showing lots & batches.

3. Quality and Inventory control procedures.

E. Permits & Certificates: Provide evidence of all certificates and permits required by Federal, State, or local authorities in sourcing, growing and transporting plants.

F. Product Data: For each type of product indicated submit copies within fourteen days of proposed use.

G. Schedule Delays: Submit immediate notice of any delays in the Work that would extend the planting times into unfavorable seasonal conditions and/or would promote the growth of the plants so much as to render them too large for planting.

H. Samples for Verification: For each of the following:

1. Mulch: 1 quart of mulch for each color and texture required, in labeled plastic bags.

2. Edging: 6 inches (304 mm) of edging for each edge type and stake type.

I. Product Certificates: For each type of manufactured product, signed by product manufacturer, and complying with the following:

1. Manufacturer's certified analysis for standard products.

2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

J. Delivery Schedule: Indicating agreed delivery dates, quantities, trailer numbers and frequency. Continuously revise and reissue as necessary.

K. Maintenance Instructions: Submit at Substantial Completion, recommended procedures to be followed by the Owner to maintain the plants during a calendar year.

L. Warranty: Submit sample of special warranty.

1.8 QUALITY ASSURANCE

A. Plant Installer: The installation of the planting shall be by the same subcontractor who is also installing the Landscape Soils and Preparation.

B. Plant Supplier Qualifications: A qualified supplier whose work has resulted in successful sourcing, growing and delivery of exterior plants.

1. Sourcing: Require an experienced plant finder whose work has resulted in successful sourcing, selection and delivery of quality plants.

2. Plant Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of exterior plants.

3. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.

4. Delivery Supervision: Require an experienced person who can assess the condition of the plants at the time of loading and unloading and who has the authority to resolve any disputes on site.

5. Installer's Field Supervision: Maintain an experienced full-time supervisor on Project site when exterior planting is in progress.

a. Personnel Certifications: Installer's field supervisor shall have certification in at least 2 of the following categories from the Professional Landcare Network:

1) Certified Landscape Technician - Exterior, with installation specialty area, designated CLT-Exterior.

2) Certified Landscape Technician - Interior, designated CLT-Interior.

3) Certified Ornamental Landscape Professional, designated COLP.

6. Pesticide Applicator: State licensed, commercial.

C. Field Observations: Plants may be subject to review both at the nursery/plantation and at the delivery site for conformity. Review at the nursery shall not impair the Project Site Representative right of review and possible rejection during progress of the Work onsite.

D. Project Site Representative reserves the right to postpone the review if, in the Project Site Representative's opinion, a sufficient quantity of plants is not available.

E. Allowance for Losses: Grow additional plants to ensure that the contract quantities shall be achieved after normal production losses from natural causes, destructive sampling, breakage, random non-conformities, transplant shock and/or delivery damage.

F. Preinstallation Conference: Conduct conference at Project site to comply with Project Management and Coordination requirements.

1.9 SECURING PLANT SUPPLY

A. Securing the specified plant material at the sizes and times required is the sole responsibly of the Contractor. The Owner has no liability for additional costs associated with potting-on or extended holding charges due to schedule delays caused by the Contractor.

B. Once the Contractor has secured the supply of the plants and submitted proof of such, the Contractor shall not cancel orders without first notifying the Owner Representative in writing.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Packing: Prior to delivery, propose suitable temporary storage locations. Deliver the plants to the site after preparations have been made and as close as possible to the time of planting.

B. Protecting: Protect bark, branches, and root systems from sunscald, drying, sweating, whipping, and other handling and tying damage. Ensure all machinery handling plants have sharp edges padded. Do not bend or bind-tie plants in such a manner as to destroy their natural shape.

1. Provide protective covering of plants during delivery. Do not drop plants during delivery.

2. Handle plants by the root ball.

C. Acceptance at Site: Inspect unloaded plants in an upright position with tops untied to enable inspection of all sides. The Project Site Representative may also review. If the plant is not in conformance with the Contract,

1. Reject and remove the plant(s) from site and replace it within 2 days at no cost.
2. Or if approved in writing by the Project Site Representative accept the plant(s) on-site and at lower value as assessed by the Project Site Representative.

D. Storage: If planting is delayed overnight after delivery and acceptance, set plants and protect from stress, traffic, erosion, wilting, wind and secure against theft.

1. Set balled stock on ground and cover ball with soil, peat moss, mulch, or other acceptable material.
2. Set plants so that no branches are in contact with the ground.
3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.
5. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F (16 to 18 deg C) until planting.

E. Size Variations due to change in schedule by The Owner:

1. Delivery or planting earlier than scheduled:
    a. If plants are smaller than specified they shall be revalued using unit prices given with the bid.
2. Delivery or planting later than scheduled:
    a. If the plants are so larger than specified that they require potting-on and/or additional time held offsite, then the Contractor is entitled to claim additional costs using unit prices given with the bid.
3. Size Variations due to change in schedule by Contractor:
    a. Delivery or planting earlier than scheduled:
        1) If plants are smaller than specified they shall be either rejected or replaced by the Contractor or at the Owner’s option revalued using unit prices given with the bid.
    b. Delivery or planting later than scheduled:
        1) If the plants are larger than specified that they require potting-on and/or additional time held offsite, then the Contractor is not entitled to claim additional costs.

1.11 DELIVERY COORDINATION

A. Allow for coordinating the actual delivery sequence and scheduling with Others who are supplying and delivering the advanced plants for the Owner.

B. Others shall deliver advanced plants by full trailer loads for each distinct area or phase shown on the Plant Schedule.

C. Provide maximum time frame for delivery, maximum number of trailers at any one time and maximum waiting time for trailers for each distinct area or phase.

D. Allow to develop and revise the delivery schedule as necessary. During delivery periods update daily to show actual number of plants delivered.

E. Any delays in the installation of the plants by the installer that results in delays to delivery by the advanced plant supplier may be subject to damages incurred by the advanced plant supplier recoverable by the Owner through the installer.

1.12 DELIVERY RESPONSIBILITIES

A. Responsibility of the installer:

1. Nominate delivery times within suppliers time frame,
2. Designate temporary unloading areas,
3. Provide trafficable access to temporary unloading areas,
4. Unload the plants & holding upright for inspection,
5. Jointly inspect the plants,
6. Store & protect the plants until needed for planting,
7. Segregate any non-conforming plants.

1.13 SCHEDULING

A. Ordering: Be responsible for searching, locating, holding and ordering specified plants that are short in supply, and/or have long lead times and/or are sensitive to seasonal dependencies. No extensions of time or additional costs shall be granted if supply is compromised by sourcing and/or ordering too late or too early by the Contractor.

B. Planting Restrictions: Plant during one of the following periods or as agreed with the Owner to protect the Warrantee:

1. Coordinate planting periods with digging periods and deliveries:
    a. Spring Planting: April to May.
    b. Summer Planting: June or August subject to weather limitations and reliable watering.
    c. Fall Planting: September to October.
2. Seasonal Contingencies: Be responsible for including and executing acceptable contingencies to reduce the risk of seasonal stress while meeting completion dates and the protecting the warrantee.
3. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit. Suspend excavation of planting pits if clay/silt based soils are wet.
4. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns, unless otherwise acceptable to the Project Site Representative.

1.14 WARRANTY

A. Special Warranty: The Contractor agrees to replace non-conforming work and non-conforming plants. The Project Site Representative shall make the final determination if plants meet these specifications or that plants are non-conforming.

B. Warranty: Warrant the following plants, for the warranty period indicated, against defects, and/or loss resulting from materials and execution including death, die-back and unsatisfactory growth, but excluding third party damage, loss, neglect, abuse, vandalism, theft and/or unseasonal severe weather conditions.

   1. Warranty Period for trees, shrubs, groundcovers: Twelve months from date of Substantial Completion.

C. Warrantee Replacements: Upon Project Site Representative's instruction remove nonconforming plants immediately and replace within thirty days when weather conditions within the specified planting season permit. Match size and species of adjacent plants. Reinstate the warranty for the corrected work from date when the correction is completed.

1.15 MAINTENANCE

A. Periodically inspect the site (not less than once per month) during the warrantee period and notify the Owner in writing if proper maintenance is not being performed.

PART 2 - MATERIALS

2.1 PLANTS

A. Propagules: Seek and obtain necessary approvals if propagation material is collected from natural and/or conservation lands. Do not use propagules from protected lands.

B. Growing Location: Supply plants grown in climatic conditions similar to those of the Project Site (USDA Hardiness Zone 7a, 7b, 8a) and then acclimated within 100 miles of the Project Site for at least 1 full growing season (May to September).

C. General Quality: Provide quality, size, genus, species, variety and sex of plants indicated conforming with the Plant List and which;

   1. Are fit for purpose and hardened-off to the proposed site conditions.

   2. Have an optimum habit and sound, healthy, growth with normal seasonal variations.

   3. Comply with the dimension requirements of ANSI Z60.1.

   4. Have a normal amount of flowers, fruit, cones, and seeds.

   5. If containerized have:
      a. Sturdy root ball when stem bends along its vertical length with no pivoting at the base or moving the root ball.

b. No cracked or broken root balls.
c. A symmetrical/radial pattern of well-branched fibrous roots without crushed/torn ends.

6. If non-containerized have:
   a. Sufficient stored energy to ensure viability.
   b. Have no weeds.
   c. Free of die-back and disease.

7. Batching: Select, grade and blend plants into batches appropriate to their final arrangement on site and delivery sequence. For formal arrangements, rows, allees, hedges and/or bosques group plants in batches so that within each batch,
   a. Trees & Hedges;
      1) Height variation between individual plants is less than 1 foot,
      2) Spread variation between individual plants is less than 1 foot,
      3) Clear height variation between individual plants is less than 6 inches.
      4) Provenance of individual plants is the same.
   b. Shrubs;
      1) Height variation between individual plants is less than 6 inches.
      2) Spread variation between individual plants is less than 6 inches.

2.2 GROWING SYSTEMS

A. Use plants that have been propagated using established horticultural practices specifically for ornamental landscape purposes and not for agriculture, forestry, retail chain sale or Christmas tree production.

B. Bare Root: Not permitted.

C. Processed Balled: Not permitted.

D. Balled and Burlapped: Sized according to ANSI Z60.1 for kind, type, and size of plant required.

E. Balled and Potted: Sized according to ANSI Z60.1 for kind, type, and size of plant required.

F. Container Grown: Sized according to ANSI Z60.1 for kind, type, and size of plant required. Grow plants in a medium that is compatible with the intended soils and site watering method. Do not carry out potting-on unless approved.

G. Fabric Bag Grown: Sized according to ANSI Z60.1 for kind, type, and size of plant required.

H. Nursery Irrigation: Use an irrigation system to achieve growth rates and optimum quality.

2.3 SOURCE QUALITY CONTROL

A. Contractor's Delivery Supervisor: Inspect the following prior to delivery and again upon delivery:

1. The quality grade, general conformance and labeling.

2. The blending and batching of plants to suit the delivery sequence.

3. The proposed on-site temporary delivery areas.

2.4 FERTILIZER

A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition.

B. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2.5 WATER

A. Provide a temporary metered connection to The Owner's potable mains. Be responsible for and pay for the distribution of water from this connection to all portions of the planting work. Remove connection prior to Substantial Completion. Additional water supply on or off site shall be at the Contractor's expense. Failures in the irrigation system shall not relieve the Contractor from watering.

2.6 ORGANIC MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Shredded Cedar.

2. Size Range: 0.25 to 1 inch diameter.

3. Color: No artificial dyes permitted.

2.7 COMPOST

A. Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 4 to 8 deci-siemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.

2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

2.8 TREE STABILZATION MATERIALS

A. Stake & Tie Systems:

1. Vertical Post & Horizontal Guy Systems: polypropylene webbing or galvanized-steel cable with rubber hose loop and hardwood or green-painted steel stakes pointed at one end and of a thickness to resist loads and be visually unobtrusive and by the length indicated on details.

2. Products: Soft polypropylene woven tie for 900 lb strength.

3. Manufacturer: Subject to compliance with requirements.

B. Proprietary Root-Ball Stabilization Devices: Proprietary at- or below-grade stabilization systems to secure each new planting by root ball; sized per manufacturer's written recommendations unless otherwise indicated.

1. Products: Subject to compliance with requirements, provide products by one of the following:
   a. Berkshire Products Inc. – “Earthwings Root Ball Anchors”.
   b. Duckbill Rootball Fixing System.
   c. Arborguy.

2.9 PESTICIDES

A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.10 MISCELLANEOUS PRODUCTS

A. Tree Watering Systems: Install watering bags that allow the slow-release of water.

1. Watering bags shall be Treegator Original or approved equal.
   a. Minimum Water Capacity 15 Gallons

b. Install per manufacturer's instructions, and fill with water per manufacturer's recommended schedule from time of planting to final acceptance.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before starting Planting, examine preceding related work. Verify that Landscape Soil works are conforming and within specified tolerances. Correct non-conforming conditions before proceeding with Planting.

B. Testing Tree Hole and Trench Infiltration: For each different soil profile without subdrainage select representative holes and trenches (not less than 10% of undrained holes and trenches) and test to ASTM D-3385. Notify Project Site Representative if infiltration rate is outside the specified range in Division 32 Section Soils & Planting Preparation. Install supplemental subdrainage to holes and trenches until infiltration rate is within specified range. Refer to Division 33 Section Subdrainage.

C. Notify Project Site Representative in writing of any non-conforming or unexpected soils and/or drainage conditions that the Contractor considers detrimental to the growth of plants prior to planting.

D. Locate and mark existing utilities, underground structures, and aboveground obstructions before planting and avoid disruption of and/or damage to utilities.

3.2 PREPARATION

A. Protect utilities, structures, foundations, sidewalks, pavements, other facilities, lawns and plants from damage caused by operations.

B. Damage to utilities: After locating and marking, verify the status of utilities. Protect or temporarily divert existing utilities to remain "live". Rectify immediately any obstruction or damage to utilities to remain "live" and provide and pay for temporary utilities whilst repairs are carried out to the satisfaction of the utility owner.

C. Damage to property: Do not interfere with or damage property that is to remain on or adjacent to the site, including adjoining property to the site, and trees. Rectify immediately any interference or damage to such property.

D. Damage to existing trees: If the trees are damaged or placed under unnecessary and avoidable stress by the Contractor, the Project Site Representative shall deduct damages from the Contractor's progress claim.

E. Existing Irrigation: Install a temporary diversion main, control cable and valves to isolate contract area and to maintain service to areas outside of the contract area.

F. Provide erosion control measures to prevent erosion, displacement of soils, discharge of soilbearing water runoff or airborne dust to adjacent properties and completed work. Be responsible for any additional temporary erosion control in areas that rely on the establishment of plant roots to stabilize soils.

3.3 LAYOUT

A. Use 3-foot lath or approved equivalent, color coded for each species to stake location of each tree and shrub. The Project Site Representative may review the layout in the field and the Contractor shall adjust exact positions before planting begins. The Project Site Representative reserves the right to refuse review at this time if, in his opinion, the layout is insufficient.

B. If it appears necessary to vary the locations and spacing to avoid utilities or to cover the area uniformly notify the Project Site Representative.

3.4 PLANTING ADVANCED TREES AND SHRUBS

A. Do not excavate if soil or subgrade is frozen, muddy, or excessively wet.

B. Excavating Holes and Trenches:

1. Excavate a square hole as shown in the drawings. Trim the base and compact directly under the root ball only.

2. Scarify all sides of the hole and trench to remove smeared hard-panned surfaces. If subdrain is shown or required, install as specified.

3. Notify Project Site Representative if any obstructions detrimental to plant health or that prevent layout are encountered in excavations including but not limited to existing utilities, unforeseeable rock, industrial landfill, hardpan layers and perched water tables. Seek direction before making any changes to the plant layout.

4. Pedestals: Place and compact drainage course material between 90% to 95% percent of maximum Standard Proctor density according to ASTM D 698 and form a pedestal. Set pedestal height taking into consideration the rootball depth and allow for initial consolidation from weight and settlement.

C. Placing: Clear surface of any weed growth prior to planting. Set plant plumb and in center of pit / trench with top of root ball flush with adjacent finish grades. Consider the form and health of each plant and accordingly rotate and/or place plants in relation to sight-lines and appearance. Use best quality plants at corners and facing pavements.

1. For B&B stock - remove burlap, twine and wire baskets from the top half of the root ball. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.

2. For container or bag stock - Carefully remove root ball from container or without damaging root ball or plant.

3. For boxed stock - Carefully remove box sides from root ball or without damaging root ball or plant.

4. For bare root stock - Spread roots without tangling or turning toward surface, and remove injured roots by cutting cleanly; do not break.

D. Backfilling: Place Planting Soil around root ball in lifts not exceeding 12 inches (305 mm), tamping to settle mix and eliminate voids and air pockets up to . of backfill depth. Do not use subgrade and/or sub bases as backfill.

1. Place fertilizer evenly distributed when backfilled . using four (4) tablets for each 1/2" of the tree caliper measured at 12" above grade.

2. Water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of Landscape Soil.

3. Ensure that all plants are plumb and set flush with the surrounding soil levels.

4. Ensure soil does not mix with mulch.

5. Form a temporary saucer with 3 inches (75 mm) high berm centered on the plant, 12 inches (303-mm) wider than ball diameter. Install a temporary 2-inch (50-mm) deep layer of mulch within berm area. Do not place mulch within 2-inches (50-mm) of trunks or stems.

E. Reinstatement: Restore any soil areas that have been compacted and /or disturbed by the planting work to a conforming condition.

F. Finish Grading: Grade planting areas to conform to specified grades after full settlement has occurred. Remove temporary saucers and mulch around trees upon installing final surface finishes.

G. Watering in: Hand-water plant foliage, rootball and surrounding soil during the same day of planting and continue watering until roots penetrate the surrounding soil. Do not saturate and destabilize soils on slopes greater than 1V in 3H.

H. Pruning: Prune, thin, and shape plants according to ANSI A300. Unless otherwise indicated by Project Site Representative, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character unless otherwise noted as a hedge.

I. Cleaning: Remove all plant containers from the site after planting and thoroughly clean all areas at the close of each day's planting.

J. Protecting: Install temporary measures to protect plants from physical damage and animal grazing until Final Acceptance.

K. Labels: Remove all plant labels upon Substantial Completion.

3.5 PLANTING SMALL TREES, SHRUBS & GROUNDCOVERS

A. Watering pots: Hand water plant containers to capacity prior to planting.

B. Excavation: Excavate planting holes as detailed to dimensions dictated by the rootball dimensions. Holes should be irregular in shape. Scarify all sides to remove smeared surface. Do not excavate into subgrade unless it has been suitable prepared as subsoil and/or subdrainage is present.

C. Placing: Lay out plants to specified spacings. Clear surface of any weed growth prior to planting. Remove plants from containers and gently tease outer roots, if necessary. Immediately set plants in the center of the hole.

D. Backfilling: Backfill with planting soil and fertilizer and ensure that all plants are plumb and set flush with the surrounding soil levels. Work soil around roots to eliminate air pockets. Ensure soil does not mix with mulch.

E. Watering in: Hand-water plant foliage, rootball and surrounding soil during the same day of planting and continue watering until roots penetrate the surrounding soil. Do not saturate and destabilize soils on slopes greater than 1 in 3.

F. Cleaning: Remove all plant containers from the site immediately after planting and thoroughly clean all areas at the close of each day's planting.

G. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

H. Protecting: Install preventative measures to protect plants from feeding-animal damage until plants are established.

I. Labels: Remove all plant labels upon Substantial Completion.

J. Replacing: 30 days after planting replace, without cost to the Owner as soon as weather conditions permit, all plants that have not shown signs of establishing roots outside of original container potting mix as determined by the Project Site Representative. Match quality and size of adjacent species.

3.6 TREE WRAPPING

A. Where freezing conditions are anticipated anytime during the Warranty Period, wrap trunks of deciduous trees of 1-1/2" or more caliper with a spiral wrapping to height of third branch. Wrap from bottom up and tie wrapping securely in place.

3.7 TREE STABILIZATION

A. General: Be responsible for all plants remaining upright and stable in all conditions from installation through to Final Acceptance.

1. Conform to the tree stabilization details.

2. Attach to trunk / stem as low as possible.

3. Verify location of utilities prior to driving stakes or anchors.

4. For formal arrangements, rows, allees, hedges and/or bosques, stabilize all trees with the same system for uniformity.

3.8 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with The Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and groundcover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.

C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.9 MULCHING

A. Mulch surfaces of planting beds and other areas as indicated on the drawings.

1. Prior to application of mulch remove all grass, weeds, rubbish and other deleterious matter from surface.

2. Organic Mulch: Apply average thickness of organic mulch shown on the drawings. Do not place mulch against plant stems.

3. Unless otherwise shown, mulch surfaces shall finish flush with adjoining paving and 25mm below tops of walls.

4. Rake surface smooth and free from clumps.

5. Do not mound mulch around trees in grass.

3.10 CLEANUP AND PROTECTION

A. Keep adjacent paving and construction clean and work area in an orderly condition.

B. Protect plants from damage due to landscape operations, operations by Others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plants.

C. After Substantial Completion and before Final Acceptance remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.11 DISPOSAL

A. Disposal: Remove surplus and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose or recycle them off site.

END OF SECTION 32 93 00